OCTOBER 1936
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ELECTRICAL WEST

In this issue a PICTORIAL INSERT of

CULDER DAM POWER DEVELOPMENT

Electric Ranges Front and Center

One of the most reliable maxims in the electrical industry is that the greatest retail profits on any appliance are made after reaching a saturation of 1,000,000 units and before reaching 5,000,000 units.

The electric range is in that sweet spot right now. For some years to come it will represent the major source of profit for the wide-awake electrical dealer.

That the range field is far from overcrowded is shown by a recent check-up. At least 30% of the dealers selling other major appliances are not yet handling electric ranges.

The trend toward electric cookery is unmistakable. The All-Electric Kitchen idea has caught the public fancy. Follow the path to profits by concentrating your sales efforts on the modern electric range.

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

10-36

Edison

CALIFORNIA'S *Electrical Age* HAS JUST BEGUN!

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), October, 1936, Vol. 77, No. 4. Published monthly by the McGraw-Hill Company of California, 883 Mission St., San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shilling). Single copy, 25c
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ELECTRICAL WEST

With which are consolidated the "Electrical Journal," the "Journal of Electricity, Power and Gas," and the "Journal of Electricity."

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*BOULDER DAM

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• CONCLUDING four perceptive discussions of human nature—of how its universal principles are maniest in the electrical industry — H. A. Lemmon chooses the title, "Let's Get Religion."—Page 15.

•

• DOZENS OF CONTRIBUTORS have attacked the problem of goodwill building during the past eleven months. The last of the contributions eligible for awards appear in this issue. Awards, based upon originality, practicability and adaptability of the idea submitted, will be announced soon.

•

• INSPECTORS CONVENED on the Pacific Coast last month, in the North and in the South. Reports of the meetings will be found in the Trade Association's section.

•

• LIGHTING LIGHTS THE WAY might serve as a slogan for the trend of home, business, school and industry to shake off the dark days of depression with modern, eye-saving, load-building lighting. The Trends section opens with a picture outline of new installations.

• RADIO INTERFERENCE is being hunted down by the Northwestern Electric Co., by means of a portable trouble finder which was developed from a commercial home receiver. Its construction is described in the Engineering Symposium.

•

• VACUUM TUBES have quietly insinuated themselves into the picture of electric control. They have stood on the merits of their performance, without much explanation of how they perform. That all electrical men may gain a quick comprehension of vacuum-tube performance, H. C. Stanley has described their principles in simple terms. His first article appears in the Engineering Symposium.

•

• ROCKY MOUNTAIN electrical men meant business when they gathered for their association convention. A report of the meeting appears in the News Section.

•

• WINTER COMING — the Appliance Sales Guide on air heaters enhances its value with timeliness.

PROOF WIRE • ARMORED CABLE • BUILDING WIRE • FLEXIBLE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • WEATHER

CORDS • RADIO WIRES • LEAD ENCASED CABLES • PARKWAY CABLE • VARNISHED CAMBRIC • SIGNAL CABLE

from start to finish

CRESCENT

performs every operation
in the manufacture of

INSULATED WIRE and CABLE

A GROUP OF HEAVY WIRE DRAWING MACHINES IN ONE PART OF THE EXTENSIVE CRESCENT PLANT

The Crescent Insulated Wire and Cable Company located at Trenton, New Jersey, has been manufacturing insulated wires and cables for electrical use for nearly fifty years. This Company has expanded, added new lines and developed new products, until its plant now occupies over 350,000 square feet of floor space and employs over a thousand people.

The high quality of its products is insured by a staff of executives, technical men, and skilled workmen, developed with a background of almost a half century of experience in this one field of manufacture.

All Crescent products from the raw material to the finished product are manufactured completely in our plant.

CRESCENT
INSULATED WIRE & CABLE CO. INC.
TRENTON, NEW JERSEY.

CRESCENT ENDURITE SUPER-AGEING INSULATION • RUBBER POWER CABLES

WHY TURN LOX is THE ANSWER

BOTH

Lamp and Reflector are detached as ONE UNIT by a slight upward pressure and a quarter turn.

3 POINT BAYONET COUPLING

- Positive lock.
- Immediate connection.
- No prongs or contacts to locate.
- Automatic Polarization.

SELF CLEANING CONTACTS

- Contacts are cleaned as the reflector is turned into hood.

SPIRAL COMPRESSION SPRING

- Insures positive electrical connection.

EASY TO WIRE

- Nothing in way or hard to reach.
- No screws to remove.

to the problem of maintaining RLM Efficiency Standards

RLM stands for certain high standards of illuminating efficiency which are certified by the Electrical Testing Laboratories of New York to be met by all products bearing this label.

Dirty reflectors which waste from 20% to 80% of their RLM efficiency are a challenge to the electrical industry which can only be met by providing installations which encourage frequent lamp and reflector cleaning...

TURNLOX is Benjamin's answer to the challenge... an answer that gives further evidence of Benjamin's leadership. This unique and exclusive Benjamin construction encourages frequent cleaning because it reduces maintenance costs and simplifies cleaning and inspection. Illustrated on this page are the salient features which have made TURNLOX, the industry's outstanding answer to the maintenance problem. Your inquiry for complete details and data on all types of Benjamin Reflectors which are furnished with TURNLOX hoods, is cordially invited.

BENJAMIN
TRADE MARK
LIGHTING EQUIPMENT

BENJAMIN ELECTRIC MFG. CO.
Dep't EW, San Francisco, California.

Send me complete details on TURNLOX.

(Print name and address below)

IT'S GREAT TO BE THE WINNER!

★ FRIGIDAIRE DEALERS WIN WITH THE GREATEST REFRIGERATOR SELLING CAMPAIGN IN HISTORY!

No wonder Frigidaire dealers are winners! The Spring "Proof" Campaign sold more Frigidaires than had ever been sold in any previous year! The Midsummer Cold-Gauge Campaign sent more than 2 million people to Frigidaire dealers' showrooms! And the Fall and Winter Campaign, now in progress, is another winner! The "Meter-Miser"—Frigidaire's *exclusive* cold-making mechanism—has been the year's sales sensation. *Proof* that Frigidaire meets *All* 5 standards for refrigerator buying has influenced hundreds of thousands to buy. Powerful advertising! Superior product! More effective dealer helps! Greater public acceptance! These are the reasons why Frigidaire dealers, adding their efforts to ours, are making more refrigerator profits than ever before!

FRIGIDAIRE CORPORATION, DAYTON, OHIO

YOU WILL DO *still Better* WITH FRIGIDAIRE . . . IN '37!

FLASH

L&H RANGES NOW EQUIPPED WITH NEW *HI-SPEED L&H Calrod*

This *is* NEWS! It means soaring sales for every L&H Range dealer . . . now that L&H Electric Ranges have the new, improved *Hi-Speed L&H Calrod*—in addition to all the other L&H exclusive, sales-pulling features.

Radically new in design . . . but drastically tested *and proved*... the *Hi-Speed L&H Calrod* is a remarkable heating element that makes electric cookery amazingly speedy and economical.

The *Hi-Speed L&H Calrod* wastes no heat. Utensils rest directly upon its glowing spiral . . . with no heat-absorbing space or material between. Cooking begins immediately . . . takes less time . . . consumes less current.

With its resistance wire hermetically sealed and insulated in an enduring metal sheath... *Calrod* is not only safer but almost everlasting. Protected against harm by foods boiling over...immune from deterioration by air or moisture . . . it will not only withstand rough usage but take more abuse than it could possibly receive in a lifetime of normal household use.

8500B-1—SILVER PEARL
L&H ELECTRIC RANGE
WITH OR WITHOUT NO. 8 HANDY COOKER

Two appliance outlets—one time-controlled, one regular. Warming drawer unit controlled by toggle switch. Adjustable shelf in cabinet. Round cornered electrically welded oven. Time-a-Ture consists of Synchronous self-starting clock, Automatic timecontrol, Temperature control, Time selector switch, two appliance outlets, lamp receptacle, pilot light, all in one unit assembly.

WRITE OR WIRE FOR COMPLETE DETAILS

A. J. LINDEMANN & HOVERSON CO.
MILWAUKEE • WISCONSIN
NEW YORK CHICAGO SAN FRANCISCO

L&H ELECTRIC RANGES

Are You

"KIDNAPPED KURRENT KONSCIOUS"?

One polyphase current "snatch" case may exceed in lost revenue, a flock of single phase cases.

You know that Superior single phase meter enclosures DO DISCOURAGE diversion and have proven their worth.

Superior Polyphase meter enclosures will do it too. Sure we'll send Bulletin 344.

Our Business is to help you get paid for ALL energy consumed

WESTERN REPRESENTATIVES

E. H. BELL	L. A. NOTT	T. S. WOOD
912 East Third Street	1061 Howard Street	220-9th Avenue, N.
LOS ANGELES	SAN FRANCISCO	SEATTLE
Dial Lafayette 8261	Dial Hemlock 4738	Dial Elliott 8204

Superior Switchboard & Devices Co.

Canton, Ohio

*Been at it Since 1920

SUPERIOR

REG. U. S. PAT. OFF.

Electric Kitchen Proves Its Worth

Persistence in the convicition that an electric installation would demonstrate its own value brought this electrical man double satisfaction: that of seeing his conviction born out, and that of seeing new boosters converted and new customers sold. He writes:

To the Editor:

Sir—Recently I built a house in order to get rid of a vacant lot. Amazing as it may seem to those of us in the electrical industry who have spent years selling the idea of electrical equipment to architects, builders and contractors, here is what happened: Without an exception, every builder I had figure the house tried to talk me out of wiring for an electric range (of course they didn't know

This model electric kitchen was what a home-seeker wanted. He bought the house while neighboring houses stood vacant

my business) and tried to discourage the installation of an electric kitchen together with Elgin metal cabinets.

I finally let the contract to V. C. Smith, 2002 W. Slauson St. He was radical against electric cooking. He told me frankly that he had talked many people out of electric installations. But, before signing the contract, I forced him to give me an order for an electric range for his home. And here's what happened!

Since installing the range, his wife has changed to a booster for electric cooking, and the two of them (she helps in his office) so far have talked three people into installing electric ranges, water heaters and bathroom heaters.

And the house I built. It sold, thanks to its electric kitchen, for $4,750, while other houses around it stood unsold.

Now I'm about to start another house, which raises another obstacle. The electrician who does Smith's work is actually opposed to all electrical equipment. He has a full gas-equipped home.

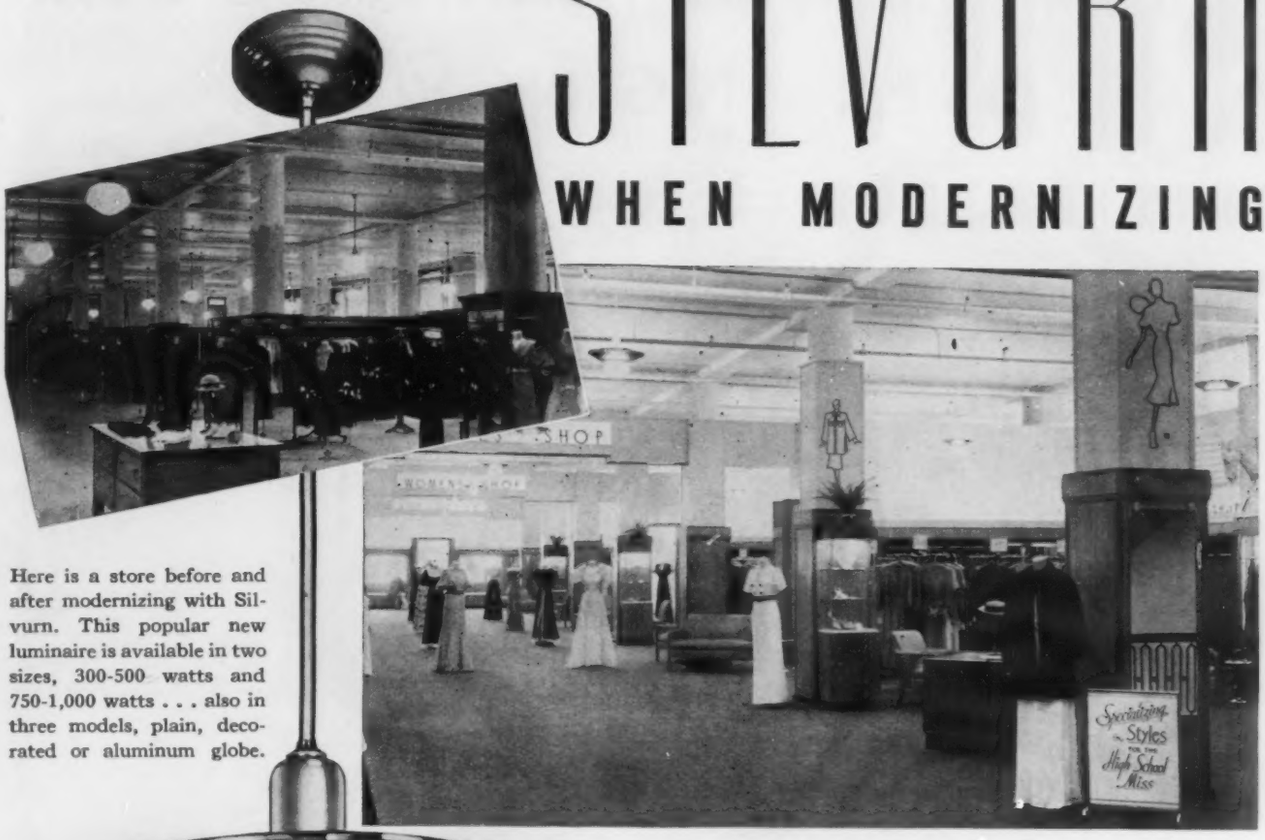
That's more evidence for my conviction that our troubles are almost 100 per cent within the industry.

But before this new house gets started, you may be assured the electrician will have an electric range in his home before he gets the job to wire mine.

Yours for a 100 per cent electrical industry,

WILLIAM P. SWARTZ,
Pacific Coast Sales Manager,
Standard Electric Ranges.

Smart Stores Select SILVURN WHEN MODERNIZING



Here is a store before and after modernizing with Silvurn. This popular new luminaire is available in two sizes, 300-500 watts and 750-1,000 watts . . . also in three models, plain, decorated or aluminum globe.

● Light is playing an increasingly profitable part in modern store merchandising. Inviting store appearance, greater ease of seeing, less customer and clerk fatigue, reduced merchandise returns are *direct results* of carefully planned lighting modernization.

The new Westinghouse Silvurn Luminaire is especially recommended, for it is designed especially to meet modern store lighting requirements. In addition to its distinctive illumination, Silvurn offers many new construction features such as Alzak processing of the aluminum which decreases maintenance costs and gives more light for the money.

Why not get complete details about Silvurn styles *now*. See your Westinghouse Distributor, or write Westinghouse Electric & Mfg. Company, Lighting Division, Edgewater Park, Cleveland, O.

WHEN YOU THINK OF *Lighting* THINK OF

Westinghouse

The Word OKONITE *or* MANSON *on tape means as much as the word* STERLING *on Silver*

The word OKONITE or MANSON on a roll of tape means that under all manner of conditions, in every kind of weather and service, these tapes stand the siege of time. Day in and day out, year in and year out, these tapes last. They last, in fact, just as long as the insulation on the wire itself.

The lifetime of a splice made with OKONITE and MANSON Tape is, therefore, equal to the lifetime of the wire. Durability, permanence—factors of true economy in the maintenance of your lines—are thus assured when you specify:

OKONITE TAPE—a rubber insulating tape, made of highest grade rubber and compounding ingredients that form a homogeneous mass of high dielectric strength and impervious to moisture.

MANSON TAPE—a rubber filled cloth tape for the mechanical protection of joints. Made by true friction method, this protective tape is unequalled in its adhesive qualities and length of service.

Write for samples and our booklet, "Splices and Tapes"

OKONITE **THE OKONITE COMPANY**
Founded 1878
and
HAZARD INSULATED WIRE WORKS DIVISION

THE OKONITE-CALLENDER CABLE COMPANY, INC.
EXECUTIVE OFFICE: PASSAIC, N. J.

New York	Boston		Chicago	Detroit
Philadelphia	Pittsburgh		Washington	San Francisco
Los Angeles	Seattle		Dallas	Atlanta
Factories: Passaic, N. J.		Wilkes-Barre, Pa.		Paterson, N. J.

UNCHALLENGED DEPENDABILITY

FOR SWITCHBOARDS *Large or Small*

Every WESTON instrument for switchboard use is built to justify its place at the nerve-center of power distribution . . . *dependable beyond the shadow of a doubt.*

WESTON users the world over take this dependability for granted . . . as an inherent attribute of the WESTON name. Thus they give attention only to factors such as readability, appearance, and the complete way in which their specific needs can be met. And here again they find further justification for a switchboard that's "WESTON equipped."

For the small control panel, or the "showroom" switchboard of a mighty power plant, there are instruments of the size and type required . . . instruments reflecting outwardly the inward qualities which have made WESTON the greatest name in electrical instrumentation for almost 50 years . . . Weston Electrical Instrument Corporation, 577 Frelinghuysen Avenue, Newark, N. J.

WESTON *Instruments*

Eicher & Bratt,
263 Colman Bldg.
Seattle, Wash.

PACIFIC COAST REPRESENTATIVES
C. F. Henderson,
420 Market St.
San Francisco, Calif.

A. A. Barbera.
Subway Terminal Bldg.
Los Angeles, Calif.

The Belmont

Hotpoint's table-top model —all-porcelain enamel. Special merchandising offer makes the Belmont a splendid alternate for the DOUBLE HOLIDAY CAMPAIGN.

Dorchester

An advance 1937 model for Christmas selling

LIST PRICE

$127.50*

F. O. B. Factory, Chicago, Ill.

COMPLETE WITH CALROD UNITS AND THRIFT COOKER

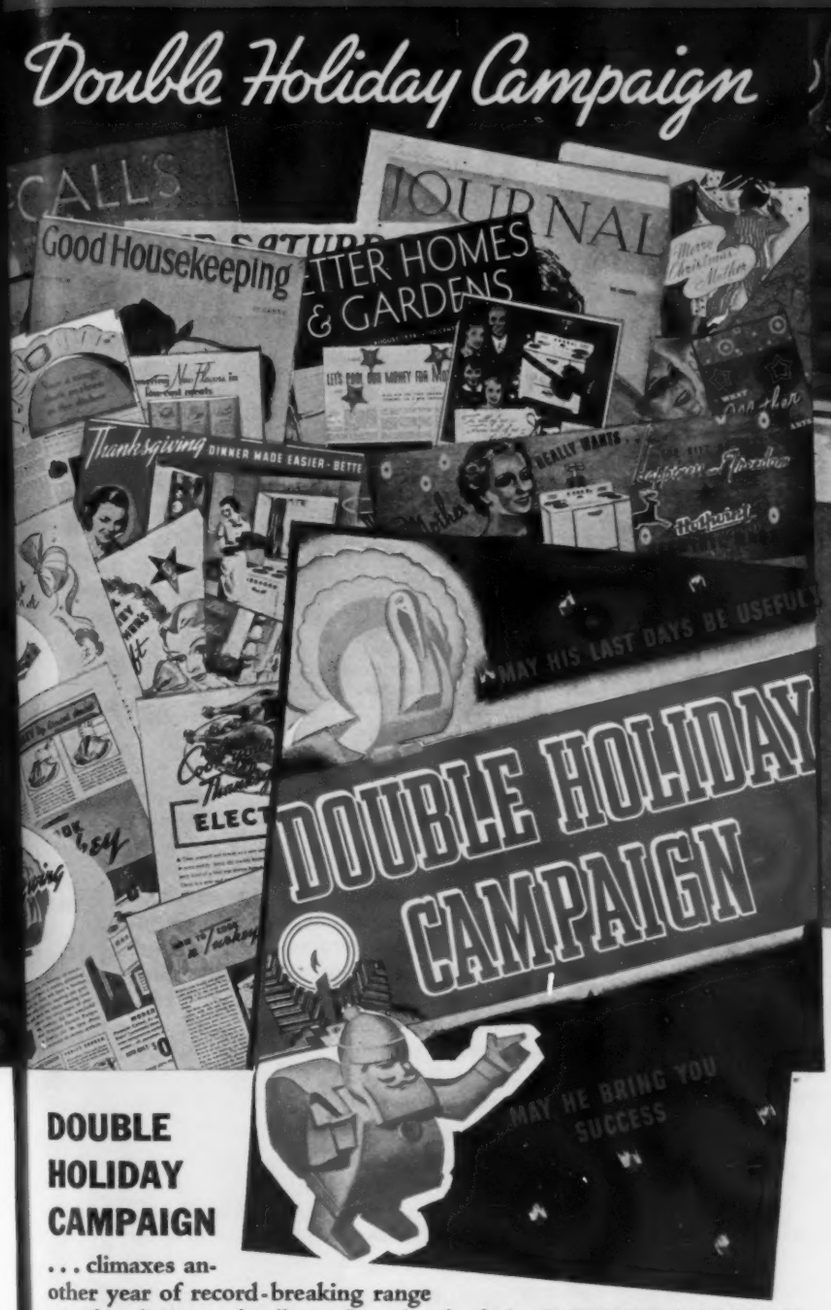
*Prices slightly higher west of Rocky Mountains

HOTPOINT'S new range sensation—The Dorchester—is the first, full-size, built-to-the-floor type automatic electric range ever offered at such a remarkably low price. Look it over. Compare its striking style, outstanding value, sales clinching price with anything on the market today.

Hotpoint designed this range for the 1937 line, but now offers it for fall and Christmas selling to give you a real volume leader to merchandise with the DOUBLE HOLIDAY CAMPAIGN.

Talk of value! The features of the Dorchester will set a new standard in the electric range business . . . So say the wise ones of range merchandising. The price of $127.50 (F. O. B. Factory, Chicago, Illinois) gives "extras" never before offered at such a price: Hotpoint Hi-Speed Units; Thrift Cooker; Deluxe matched and fitted accessory group with modern chrome Lamp, flood-lighting work surface; twin black Pottery Condiment Jars and Minute Minder Automatic Timer (times cooking operations from 1 to 60 minutes); Oven Temperature Control; Extra large, heavily insulated Oven; Super-speed Broiler; Utility Drawer; Divided Range Top of acid-resisting porcelain enamel; Oven door white porcelain enamel; balance of range white Calgloss enamel. Truly a bargain leader!

Double Holiday Campaign



Calrod

Hotpoint's Hi-Speed Calrod has made electric cookery history. Hailed by the industry as the leading factor in gaining popular acceptance for the speed, long life and economy of the modern electric range, Calrod becomes the pivot of the nationwide swing to electricity as the ultimate fuel for cooking. Watch the Saturday Evening Post for Hotpoint's color page advertisements which dramatize the story of Calrod's speed, economy and durability to nearly 3,000,000 families.

DOUBLE HOLIDAY CAMPAIGN

. . . climaxes another year of record-breaking range merchandising and selling. Spearhead of the DOUBLE HOLIDAY CAMPAIGN is Hotpoint's national advertising with strong gift appeal in **SATURDAY EVENING POST, LADIES' HOME JOURNAL, McCALL'S, GOOD HOUSEKEEPING** and **BETTER HOMES AND GARDENS.** More than twelve million families—nearly ⅓ of the nation's total—will be bombarded with the story of the new Dorchester as the gift that "Mother Really Wants."

AN ENTIRE NEW SALES ACTIVITY

The DOUBLE HOLIDAY CAMPAIGN gives you specially designed material and complete plans for Thanksgiving and Christmas selling. Everything is new! Plan Book, direct-mail, newspaper advertising, window display, posters and a novel Turkey-Time contest for retail sales people.

Get in touch with the Hotpoint representative in your territory today and get the complete story about this great sales-building campaign.

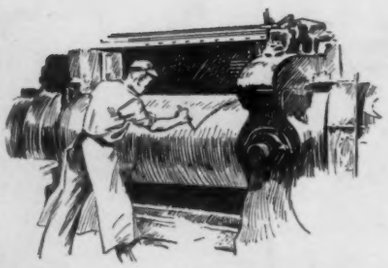
EDISON GENERAL ELECTRIC APPLIANCE CO., INC.
5612 West Taylor Street, Chicago, Illinois

ELECTRIC Hotpoint RANGES

WATER HEATERS

ROEBLING

Rubber Insulated Cables



Sketch of our 84" Rubber Sheeting Mill, one of the many modern operations in the making of Roebling Rubber Insulated Cable.

Shown is only one of the Roebling Line of rubber Insulated Wires and Cables. They are made in a variety of insulated compounds to exactly meet a wide range of requirements such as, power transmission, railway signalling, building wiring and many other purposes.

Plain Rubber 60% Sheath Power Cable. "SAFECOTE" Rubber-insulated and Braided Wires and Cables: Code, Intermediate, 30% and 40% Performance, 35% and 40% Performite. 40% and 60% Sheath Flexible Cords. Parkway, Service, Mining, Welding, and Control Cables; Tree Wire.

These will give you a fair idea of the completeness of the Roebling Line. They are made in a wide range of sizes and voltages. Armors:—steel, zinc, or bronze tape, or round steel wire.

JOHN A. ROEBLING'S SONS CO.
Trenton, N. J. *Branches in Principal Cities*

OVER 60 OTHER TYPES

Power Cables; Paper; Cambric; Rubber » Parkway Cable » Tree Wire » Service Cables » Station Cables » Rubber Covered Control Cables » Rubber Covered Wires and Cables; Code; Intermediate; 30% and 40% Performance; 35% and 40% Performite; Plain Rubber 60% Sheath Power Cable and 40% or 60% Sheath Flexible Cords » Slow Burning Wires and Cables » Weatherproof Wires and Cables » Submarine Cables » Portable Cords » And a wide variety of other wires and cables.

TRADE MARK JAR REG. U.S. PAT. OFF.

ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING

THAW OUT
Those Extra Profits *with Arvin Fan-Forced* ELECTRIC HEATERS

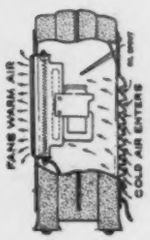
DE LUXE No. 200 $8.95 LIST

Sectional view shows how fan circulates air in through louvres in back, past nichrome helical type heating coil. Warm air is then forced out through front chromium grill.

SAFE, PORTABLE HEAT

● Cold cash too often freezes in customers' pockets . . . but Arvin Fan-Forced Electric Heaters usually thaw it out—to your profit. A demonstration will prove Arvin's "defrosting" ability and convince your customers of the remarkable comfort in Arvin's gentle tropical breeze. On frosty mornings—to counteract drafts—for after bathing—for baby's bath and in the nursery—for countless occasions Arvin provides extra portable warmth and healthful circulation.

Call an Arvin jobber today for your first order. A five-year record proves Arvins are fast-selling.



Approved by Good Housekeeping Institute and Underwriters' Laboratories

Rear View No. 200

STURDY, LASTING CONSTRUCTION

Fan motor is induction type. No radio interference. Needs no attention except few drops of oil two or three times a year. Operates on 110-125 volt AC, 50 to 60 cycles. Heavy gauge steel cabinet, permanent green morocco finish. Rubber feet that won't scratch. Nichrome helical type heating coil completely enclosed—won't burn fingers or mar furniture. Safe for children. Order today.

STANDARD No. 100 $6.95 LIST

ARVIN *FAN-FORCED* ELECTRIC HEATERS

NOBLITT-SPARKS INDUSTRIES, Inc., Columbus, Ind.: Please send full information on Arvin Fan-Forced Electric Heaters.
I am a ( ) Jobber ( ) Dealer.

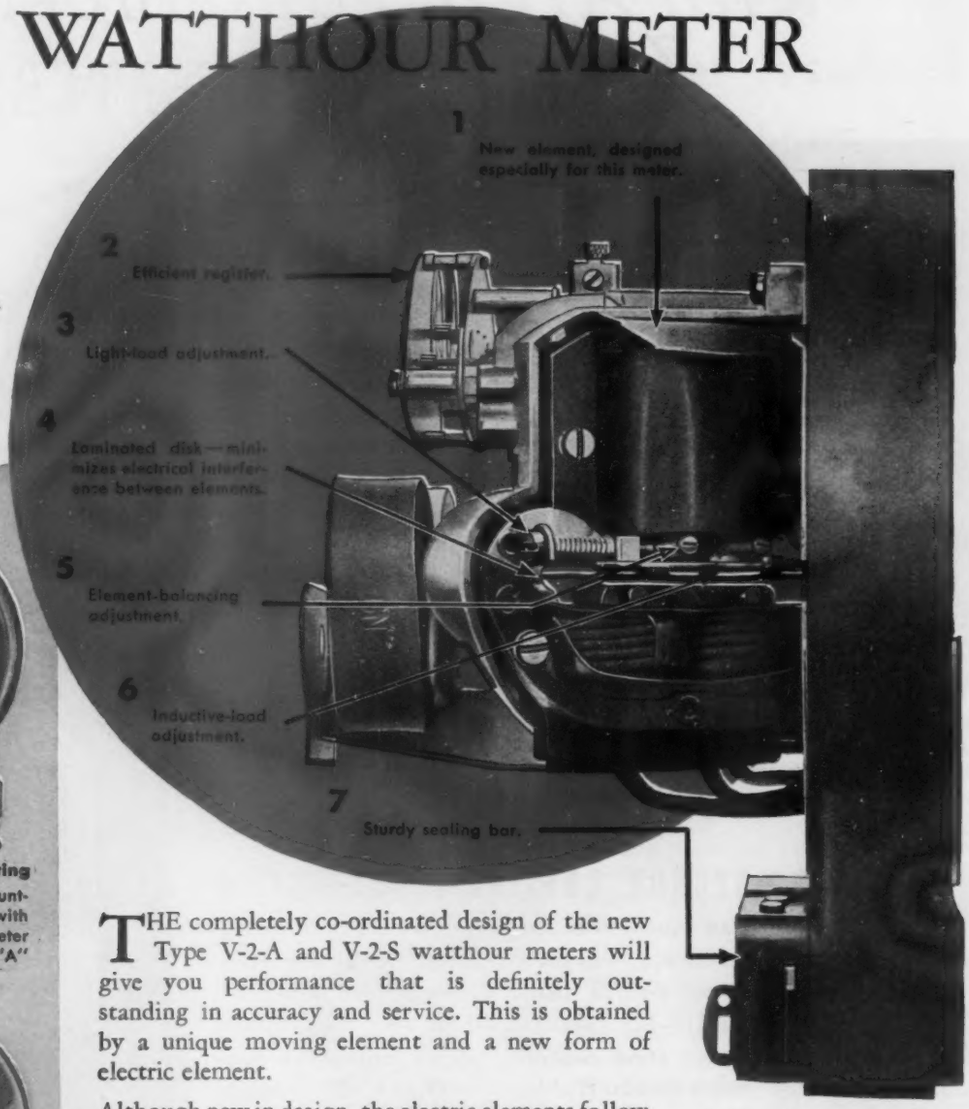
FIRM NAME..... ADDRESS.....

PLEASE PRINT PLAINLY

It's Here...

The NEW TWO-ELEMENT SINGLE-DISK WATTHOUR METER

Light in Weight
Low in Price



Type V-2-A for Wall Mounting

The Type V-2-A for wall mounting can be used by itself or with any standard single-phase meter trim, and also with the Type "A" connection box.

Type V-2-S for Socket Mounting

Sockets are the same as those for single-phase meters except that they have one extra terminal for potential connection.

THE completely co-ordinated design of the new Type V-2-A and V-2-S watthour meters will give you performance that is definitely outstanding in accuracy and service. This is obtained by a unique moving element and a new form of electric element.

Although new in design, the electric elements follow the fundamental principles to which G-E watthour meters owe their superiority. They are compensated for all classes of temperature errors, and are but little affected by wide variation in voltage, power-factor, or frequency.

New design of the moving element has made it possible for both electric elements to act on the disk with negligible interference.

Write to the nearest G-E sales office, or General Electric, Dept. 6C-201, Schenectady, N. Y., and we shall be glad to send you a copy of GEA-2404 describing this meter.

400-21

GENERAL ELECTRIC

ELECTRICAL WEST

[*Devoted to the economic production, transmission and distribution of electric power and its application to industry, commerce and the home in the Pacific Empire, and to the sale and distribution of electrical utilization devices, equipment and appliances in that area*]

OCTOBER, 1936

•

Let's Get Religion

NOT *what* is done, but rather *how* it is done is what registers as sincerity in public relations; in internal relations. Here is a message that everyone who has any degree of authority over other human beings will profit by taking into his philosophy, be he chief executive or straw boss, or even if he merely aspires to rise to a position of authority some day. As the concluding article of a remarkable series of four it answers the baffling situation set forth in the first article, "Human Nature—A Puzzle", which appeared in March, 1935. It furnishes the antidote for the irritations disclosed in "What Makes an Anti-?", which ran in our January, 1936 number. It provides the key to unlock the big doors of public approval as discussed in "Very Small Keys Will Lock Very Big Doors", in our July, 1936 issue. Whether you are an executive, or want to be, or even have lost hope and slumped to the dead level of "just working here", which puts an end to growth, there is a real something in the challenge expressed in "Let's Get Religion" that will make a better worker or boss of you and restore your hope and opportunities. It will turn associates into friends and bring the public into a happier frame of mind, which means self respect in serving them. In the opinion of the editors there has never been written so understanding or so penetrating a series of articles on this greatly discussed platitude—public relations.

By H. A. LEMMON
Sierra Pacific Power Co.

THIS is a recital of platitudes. Webster tells us that a platitude is a commonplace, a trite or stale idea or wording. It is a pity that even Truth, repeated often enough, becomes a platitude too.

Going to and from our homes each day we pass a certain billboard. A year ago the message painted thereon was startling, thought-awakening. Now we don't even see it, or if by some quirk of chance it is thrown into the range of our consciousness, we wonder how it could have seemed so vital when it first appeared. Today it is inane, trite, dull, stale—platitudinous.

The Ten Commandments are platitudes. When Confucius enunciated the Golden Rule, he said what was destined to be a platitude. The Sermon on the Mount is made up of platitudes. The immortal speech at Gettysburg is commonplace with platitudes. Yet all of these are among the vital utterances given to man. The Commandments are a crystallized code, the best and most ethical thoughts, and of the experience of a progressing civilization. The philosophies of Confucius have guided the destinies of more millions of human beings than have ever been consistently revered by any other groups of people. The speech of Gettysburg was a divine spark which touched the inspirational aspirations of a nation. And yet all of these—and the many other guide posts which have been erected along the way—have become mere platitudes. Platitudes, because they are truisms; truisms, because they are undoubted, unquestioned and self-evident. And so, while we hold them as such in our inner consciousness, they no longer arouse us to aggressive acquiescence. Almost

they are lost in the complexities and the diversions of a rushing, heedless world.

Human Relations

In our own industry much academic concern is paid to the individual organization's "Public Relations" and "Internal Relations." Without the latter, there can be no satisfactory accomplishment of the former.

When we talk and write about Public Relations and Internal Relations, we are merely recognizing the fact that necessarily in a business serving the people we have relations with them, pleasant or otherwise, and when we speak of Internal Relations we are reiterating the obvious fact that the several units of any organization must necessarily have organization—contact one with another. Whether such contact be agreeable or otherwise, some sort of relations are inevitable.

Therefore, after all, what we are striving for is not those indefinite, complex, intangible things known as Public Relations and Internal Relations, but for the far greater boon, Human Relations. With the sincere desire to be human, our whole problem becomes simple, without any thought of the intricacies involved in the many kinds of relations.

There are many paradoxes in life. One of them is that Human Relations begin at the top and are best exemplified at the bottom. Any organization develops characteristics which quickly become the soul of it. If that soul is a beautiful thing, or if it is a distorted, repugnant monster, the credit or the blame—and the credit and the blame—must be placed squarely to the one or ones who are directing it. Employees will inevitably adapt themselves to the spirit and to the soul of any institution of which they are a part.

Applied by Rule

Perhaps it is too much to expect of still imperfect humanity that one man shall be all things to all people. Yet it should be realized as one of the responsibilities for which he is compensated and elevated above his fellows that the chief executive reflect a spirit which will permeate down through his organization to every level. Then every sub-executive will assume by example his share of this spirit and responsibility, and no matter what his station along the line of authority over some of his fellows, this type of human relations shall prevail.

Human Relations are not a product of formula; they are a religion. They come from a great soul filled with consideration of others and the desire to be helpful, and from a heart which beats with sympathy, feeling, tenderness and understanding. The head of one great public utility organization complained, "Of course, I know that my employees are not loyal in the strict sense of the word; yet I have done everything possible for them. I have given them almost everything they have asked for. Not one of them who receives an injury or is ill but receives

H. A. LEMMON

flowers, books or what-not. I give to all of the movements they initiate for themselves—their baseball team, their picnics, their dances; I don't penalize them for unavoidable absences. Almost I would be afraid to let my directors know how much of the company's money I spend for my employee welfare. And yet," he sighed, "I know that they are not loyal."

Yes, he gave them everything—except of himself.

Those flowers and those books which went to the sick were merely a part of the office formula. His secretary made it her business to receive reports of all illnesses, marriages, births and what-not. Immediately such came to her attention, she had the purchasing agent phone to a designated florist; she called up the hospital; called up the home in the principal's name: the formula. A personal touch as impersonal as an insulator. Those congratulations, those notes of sympathy, were *merely signed* by the executive. They were not his. He didn't really rejoice with other employees on the glorious occasion of the wedding anniversary. He didn't feel a pang at the thought of the misery and the unutterable sorrow that had touched that little household. It wasn't his sorrow; it wasn't his joy. He noted the incident—when called to his attention—as an incident; as a formula, as one of the things that is supposed to be the appropriate thing to do. Yes, he sent money to the stricken household; that was something. It was more than something, but it lacked that other and greater thing which would have been more, so much more.

His employees were glad to be able to participate in the activities made possible because he sent them a check for the purpose, but more than all of this would have been a real personal interest in their affairs, in their games. His presence to encourage them to greater efforts, to excellence—a participation with them. Not interested? He should be interested. They are his boys and girls. He is supposed to be one of them. A great soul interests itself in itself and its own convenience last, and in that of others first.

No, writing a check, however important it may be, and no matter how gratefully received, doesn't completely discharge the obligation of Human Relations.

The cashier was grievously ill. Everybody loved her; her infectious smile and her expressive face which reflected everything wholesome and beautiful in its lines. The executive filled her room in the hospital with gorgeous and expensive flowers. At her bedside was a pile of books and magazines which she was still too low to read. On the table was a note signed by the department head. It wished for a speedy recovery and told her how "We all are looking forward to seeing you with us again." Possibly she had read it before on other similar occasions. It was a product of the formula. At the moment, at least, her thoughts were elsewhere—if they were anywhere.

Outside the Rule

A little girl, through some mystery known only to children, managed to slip by the outer guardians of that hospital and reach an attendant. What wiles that tot used must remain unrelated, but contrary to everything in the way of institutional routine and discipline, the fact remains that she did cajole the head nurse into taking her in to see the "pretty lady that mama pays money to." With an apologetic explanation, "It won't do any harm; Miss Blank will never know she was there," she took that youngster into the room. In her little hand she held a much crumpled, much torn, comic strip from the funny paper, "Orphan Annie." She laid it on the bed and then stood in contemplation of the marvel of it all, possibly somewhat dismayed, for her piercing voice quivered a bit. And, wonder of wonders, the eyes of the sick lady opened; slowly comprehension came into them, and then a smile—and such a smile.

The flowers and the books and the note were the formula for such occa-

sions, made and provided. That child's tribute was religion.

Hokum? Sob-sister stuff? Bunk? Sure! But it happens that it occurred precisely as written: Keokuk Electric Co., Keokuk, Iowa. No, merely writing a check doesn't absolve the debt of man to mankind.

To Give or Not

Why should employees be loyal? Loyal to what? Said one of them: "If I am employed by a concern which fairly compensates me for my eight hours effort and, on my part, I give it value received, why under these facts, isn't the transaction completed day by day. I certainly owe the company nothing more than a full and honest day's work. Likewise it owes nothing to me which it has not paid. It is purely a business transaction, presumably mutually profitable. When I pass out of the front door at 5 o'clock in the afternoon I have completed my day. Why should I take the company with me when I go home. It isn't my company. True under certain specified circumstances I receive certain benefits by my employment. I get two weeks vacation with pay, but most other organizations do the same. It is the custom of industry. And there are many other things which make my employment with the utility somewhat more agreeable than that enjoyed by some of my neighbors elsewhere. But being merely formulas peculiar to my industry they are administered as a matter of course and impersonally." And then he continued: "If loyalty means faithfulness, and fealty, I am loyal. If loyalty means sentiment and devotion, perhaps I am not loyal. If the company expects me to work out of hours to help it pull its chestnuts out of the fire, I will do just as much of this as I feel is necessary to hold my job."

Loyalty is something more than a sense of duty. Things which are easy to give are frequently not worth receiving.

Top to Bottom

Why should a dividing line be drawn between management and other employees of a company? The management doesn't own the institution any more than does the meter reader. And where is that very definite dividing line? Management hasn't a history of accomplishment which entitles it to be set apart from the salesman or the bookkeeper. With Cassius we may well exclaim: "In the name of all of the Gods at once, upon what meat doth this our Caesar feed, that he is grown so great?"

There is no such dividing line. Every employee is of the management, management is of the employees. All are fellow employees. If through any perverted idea management has assumed that it itself is the employer, it is operating a company that is conducted without spirit and without that thing we like to think of as soul, and if it wishes to retain its job and the respect of its community it had better get religion and get it quick, for that company is hopelessly mismanaged. Its so-called public relations are bad, and its internal relations are worse.

Unless the top of a concern has some sort of business religion he has no right to be in that business. Such a one cannot possibly inspire that hearty cooperation, that unselfish devotion, that conviction and sincerity in the justice of the cause, which welds the individual units into a compact, aggressive fighting force. He fails to get loyalty simply because he doesn't deserve it.

Side by Side

A well managed company or district, or department, will be one in which all employees from manager to meter reader are fellow workers and that fellowship will not cease with the stroke of the clock at quitting time. The executive will be interested first of all in the welfare and the happiness of his fellow employees. They will talk together, will work together and will play together. His thoughts will be mainly of them. They are his boys and girls. He will order his life to fit into theirs rather than try to make them fit into his. Everyone of them will be his friend—not by word, but in fact. He will be the friend of every one of them, not because it is policy or because it is the formula, but because of his genuine love for them. He will forego many outside pleasures if he does this right, but if he sincerely loves his job he will rejoice in this relationship and this friendship which will open new vistas to him. When they are ill or need a helping hand, he will conduct himself just as any close friend would do under similar circumstances. He will gain their confidence by giving his confidence to them. They will learn of the problems which harrass him and will share them.

Perhaps in their eagerness to be helpful they will consume valuable time with their suggestions for betterments. Most of these will be impractical and unworkable, but he will nevertheless be glad to receive and will gravely consider them. Each contributor will leave a feeling that he is an appreciated part of a great organization, of which he is proud to have been given a part. The executive will not make the mistake of letting it be seen or sensed, that the proposed scheme was old when Towser was a pup and that even then it was no good, but instead will permit him to feel the inner glow of having offered something of value.

Cue for Executives

The wise executive will quickly place his visitor at ease; establish an atmosphere of partnership; show a deep and genuine interest; ask questions, draw him out and discuss the matter at length until finally perhaps the fellow employee himself begins to be doubtful of its workability; not because the executive said something to lead him to this conclusion, but because unconsciously he has absorbed the truth. No one pointed out the "bugs" in the plan; oh, dear no, they found themselves. No competent leader of men is too busy, too untactful to fail to fan the flame of earnest helpfulness in the brain of a subordinate or to squelch it by discouragement or impatience at its absurdities. He had far better keep the important citizen waiting in his outer office than in any way curtail or minimize the importance of that interview with his fellow worker. For he is one of the tools which permits the machine to function efficiently or, which dulled, ruins expensive products. These are precious moments in organization building.

Whenever an executive is besieged with enthusiastic workers with what they fondly believe to be constructive suggestions from all departments and from all stations, he may know that the spirit is right and that all is well within the house. He will know that his "gang" has paid him the greatest and sincerest tribute he can ever attain, by making him one of them. And if he is the man who is worthy of that honor he will contemplate it with awe and humility. There will no longer be room in his mind for pride and arrogance.

And then very soon, at first occasionally, then a bit more frequently, and then constantly he will over-hear parts of conversations not intended for his ears—not about *the* company but "of *our* company" and lo! a soul has been born—the soul of a corporation—a family has come into being and a unity of minds has been accomplished, united in a glorious effort to carry the new religion of loyalty—intelligent, unselfish loyalty out to all the world, over interdepartmental lines, over the threshold on which the public treads.

And so suddenly there are no internal relations. Instead there is a gorgeous aura of Human Relations.

P.G.& E. Shows Farmers Benefits from Pump Testing

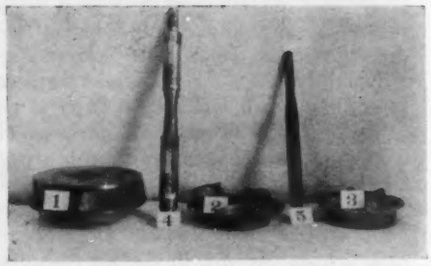
RURAL power customers served by the Pacific Gas and Electric Co. are given a full explanation of electric pumping, pump efficiencies, pump testing and agricultural power rates in a new booklet just prepared for distribution to the company's 40,000 agricultural power users. The impracticability of interviewing this number of customers personally to bring them the story of the service offered by the company was responsible for the determination to do the job effectively by means of a simple, clear and profusely illustrated booklet.

Every phase of electric pumping is covered, starting with a discussion of rates and concluding with a description of how pumping costs may be reduced through the installation of a supplemental reservoir. Statements are included from farm customers who have benefited from pump tests. Typical of the simplicity and sincerity of the explanatory matter is the following discussion of rural rates:

"Many people believe that electric rates, as fixed by law, guarantee the company a certain return on its investment. This is a mistaken idea. Actually, the percentage set by the Railroad Commission is a *limitation*, not a guarantee. *And this limit has never been approached in the rural sections of our territory.* In fact, a recent survey covering a large agricultural area in the San Joaquin valley showed that our revenues from farm power were *less than cost.* Now that may be hard to believe, but the explanation is simple. (1) California is primarily an agricultural state. (2) When farm produce is exported or sold outside the state, it brings new money into the state. (3) Electricity helps the farmer to produce more, to export more, and farm rates should allow for this fact. If they included all the costs of service, the use of electricity on the farm would have to be curtailed. Everybody, in every line of business would lose, employer and wage earner alike. These fundamentals have been recognized. To quote of the Railroad Commission's 1923 decision: Farm electrical service '*does not and should not bear its ratable share of the costs.*' And needless to say, it never has.

By way of comparison, U. S. government figures show that California farmers are using 66 per cent of all the farm power consumed in the United States, yet they are paying only 33 per cent of the bill. Even in their homes they are paying 30 per cent less than the average elsewhere, and less, believe it or not, than the residents of such densely populated cities as New York. This takes us back to our original thought: That farmers are better and more cheaply served by a big, regional electric system. In weighing the value of such a system, it should not be forgotten that it costs more to serve 3 customers per mile than 300—that is, *more per customer.* Still the rates paid by our widely scattered agricultural customers are not only low, they are less than the rates paid by any other group or class. True, this is the Railroad Commission's policy. But the fact remains that it takes a company like ours—a company doing a big, diversified, regional business to carry that policy out."

Effect of pump efficiency on overall costs is demonstrated by examples, pointing out that in each instance the rates are the same. Causes for inefficient pumping plants are listed as worn out bowls, poor lubrication, faulty installation, plugged up runners, obsolescence, wear and tear and drop in water table.



Reasons for high power bills are shown in these exhibits from pumps tested by the crews. (1) Impellor which had block of wood and two stones lodged in ports; (2) Impellor worn thin by abrasive sand with resultant loss in delivery; (3) Centrifugal impellor poorly cast with vanes broken off (this pump tested only) 10 per cent efficient); (4) Excessive shaft wear on both sides of bowl assembly; (5) Shaft partly deteriorated due to galvanic action. The lower picture shows another view of the three impellors

Typical pump testing equipment with Robert Herzer and C. E. Ginochio of the Sacramento Divi-Crew

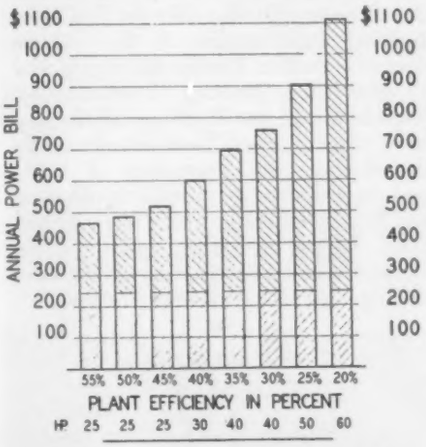
In explaining the pump testing service offered without charge by the company, figures are cited showing that more than 4,000 tests have been conducted since the service was inaugurated in 1932. About half of these tests revealed inefficient, wasteful operation. Most of these cases required complete overhauling of the plant. Re-tests were made on 864 plants. Typical examples of savings effected are shown in the examples cited in Table I. Cost of maintaining the three pump testing crews is estimated as $20,000 per year.

Table I — Typical Cases Where Pump Tests Brought Increased Efficiencies

Case No.	Efficiency First Test	Efficiency Final Test	Annual Saving
534	25.7	54.0	$127.32
536	43.0	58.1	73.23
643	36.1	61.4	78.26
1010	37.6	56.6	99.92
14	28.7	48.5	203.83
229	22.9	68.6	477.86
331	35.1	58.8	413.10
689	22.3	55.0	67.94
991	51.2	60.0	151.84
92	39.7	53.6	389.84

Gas and diesel engine competition is met with a clear discussion of the advantages of electric motors coupled with testimonials from farmers who have changed from engines to motors for pumping. The following is quoted from the discussion of engines:

"Engines have their uses—we clearly recognize that. But only where elec-



Relation of pumping plant efficiency to annual power bill is shown in this chart which relates to delivery of 162 acre-ft. of water at a rate of 500 gal. per min. from a depth of 100 ft. At 20 per cent efficiency a 60-hp. motor would be required and the annual bill would be $1,100

tricity is not available. The spectacular use of diesels on boats and trains pays silent tribute to the electric motor, for a motor turns the wheels; the engine simply turns the generator. With an abundant supply of cheap, never-failing electric power right overhead, California farmers can hardly afford to use anything else. And they apparently realize it. At press time, our Agricultural Survey covered 9,762 farms. Of this number 5,002 were found to have irrigation pumps, of which 4,683 or 93 per cent are electric. Turn that fact over in your mind. Weigh it carefully. Then consider this: Our records show that for every one person who changes to an engine, 8 are installing electric motors. And 4.5 of these eight are old customers coming back to a motor after trying something else. When the time comes for you to select a new pumping plant, consider the experience of others. Reason will tell you that no power plant would be a 10 to 1 favorite of farmers unless the cost was right."

The booklet was distributed to pump-owning visitors at the company's exhibit at the California State Fair and is being sent out in response to requests generated by advertising in the farm papers. Rural power representatives also present it to pumping plant owners.

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Strong Local Interest in Puget Sound Rural Ads

Backed by extensive research, an advertising campaign with an exceptionally authentic appeal has been employed by the Puget Sound Power & Light Co., to build rural load. Newspaper ads, localized to apply to a given county, are used. The message is the extreme low cost of electricity for farms.

Each ad shows the picture of a farm and the picture of its owner or manager. Appliances used on the particular farm are listed, and the rate which the farmer paid for his electricity is prominently displayed.

Copy in a typical poster reads:

ELECTRICITY IS CHEAP
ON THIS RANCH
IT IS LESS THAN 1⅞ CENTS
PER KILOWATT HOUR

(picture of farm and owner)

"My cost for electricity, I should say, is only half what it was six years ago. I certainly am a satisfied user. In fact I hardly know how I could farm my own place, of about 500 acres west of Ellensburg, without it. It makes possible the comfort from our oil burning furnace—and countless other conveniences and advantages," says Fred Hanson, who owns a total 10,240 acres in

KITTITAS COUNTY

This is followed by a list of appliances used by Mr. Hanson and notice that the Puget Sound Co. rural electrification engineers will be glad to help any farmer get more for his electric dollar.

In the selection of farms to be used as samples, consideration was given to the efficient use of electricity, according to S. P. MacFadden, vice-president of the company.

British Use Electric Heat To Force Grain Sprouting

An electrically heated cabinet for forcing the quick sprouting of various types of grain to be used as fodder for conditioning high grade livestock has been developed in England. The sprouted grain is used to provide a succulent fresh plant food all the year round as an efficient substitute for spring fodder. It is produced in a cabinet which consists of six compartments, which are seeded on successive days so that one cabinet in full usage has six crops in successive stages of growth. Heat is maintained thermostatically at a constant temperature. The seeds are twice daily automatically flooded with water containing a chemical nutrient. Any type of grain may be grown. The models developed in England have capacities of 480 lb. and 240 lb.

●

• The Farm Wiring Problem is a 28-page illustrated booklet published by General Electric Co., based on material presented by H. G. Knoderer, commercial engineer of the company, before the recent annual meeting of the American Society of Agricultural Engineers. Mr. Knoderer's discussion of what constitutes adequate wiring for model farm homes and outbuildings, methods of estimating costs, specifications, lists of equipment needed, and supplementary reference material are included in the booklet. It is available through the company's Appliance and Merchandise Department, Bridgeport, Conn.

●

• Electrical Refrigeration for farms is the first subject selected by General Electric Co., in a campaign designed to demonstrate the advantages of electricity for rural use. First step in the campaign was publication of a book covering the whole field of farm refrigeration in terms easily understandable to the layman. Included are facts demonstrating how spoilage can be reduced to a minimum, allowing produce to be kept fresh, assuring top prices at low cost. Free survey service is offered to farmers, enabling them to learn from a trained engineer, the cost of electrically modernizing their farms.

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• Diversity featured the exhibit of the Pacific Gas and Electric Co. at the California State Fair at Sacramento this year. For the farmer there were pump test demonstrations, a garden lighting exhibit, electric soil heating and sterilizing, insect exterminators, farm refrigerators, electric poultry and dairy appliances and applications. Newest promotional effort was a talking motion picture showing the company's facilities and services as well as many electrical applications.

Cooperation on Parade + + +

[*Forecast of forthcoming cooperative merchandising activities, and review of activities in progress or completed, a summary of cooperation at work throughout the West*]

San Diego Bureau Names Officers at Dinner Meeting

WIND-UP of an unusual year of activity just before the closing of the San Diego Exposition for the Bureau of Radio and Electrical Appliances of San Diego County was its annual dinner-meeting and election of officers at the House of Hospitality in the fair grounds. Harry Callaway, retiring Bureau president, presided over the dinner and entertainment.

Elected to the offices of the Bureau for the ensuing year were: H. E. Brunelle, Leo J. Meyberg Co., president; W. E. Wendel, H. L. Benbough Co., first vice-president; Frank Munro, G. E. Supply Corp., second vice-president and Sam L. Hall, Electrical Supplies Distributing Co., treasurer. On the board of directors besides the officers were elected Leonard J. Harris, San Diego Standard Electric Corp.; Taylor Brown, Parmelee Dohrmann Co.; F. M. Scott, Walkers Department Store; Glenn Dutton, Dutton's Radio Store; Arthur Francis, Churchill & Cassou, Escondido; C. W. Kinmore, Kinmore Electric Co., Chula Vista; Ben Rogers, Firestone Service Stores, Inc.; Ralph French, French's Radio & Refrigeration Service; E. W. Meise, San Diego Consolidated Gas & Electric Co. and Harry Callaway, retiring president, Thearle Music Co.

During the entertainment was announced the Bureau's forthcoming radio program to promote more adequate wiring in new homes. An address by Leland Stanford also featured the program.

A review of the benefits received as the result of conducting the Palace of Electricity as a sales stimulus for all electrical appliances during the last year of the fair proved this sponsorship profitable to all in the electrical industry. Price maintenance and ethical turn-in policy have also materially improved retail conditions as a result of group activity in San Diego.

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• STOKERS—In its second month is a cooperative campaign between dealers and Utah Power & Light Co. for the sale of automatically operated coal burning stokers. Approximately 2,000 stokers were sold in the territory last year. Public sentiment supports this heating method which utilizes Utah's coal resources. In charge of the campaign were Horace Siegel, B. Y. Hardy, Howard Christensen, B. P. Manley, W. D. Eldridge and C. G. Biesinger.

The Whole Story

Operation as well as presentation of equipment is afforded within this new Thermador demonstration car. Right to the doorsteps of California dealers it has taken the complete story of electric air and water heating

Alameda and Dealers Start Hotpoint Campaign

A carload of Hotpoint electric ranges has been set as the goal for dealers and the Bureau of Electricity in the city of Alameda for a fall campaign. W. R. Paulson, general manager, staged a meeting of dealers together with the sales and service staff of the Bureau to discuss plans and to complete arrangements for the cooperative campaign.

At the same time a report of sales of appliances in Alameda since the first of the year was made. Manager Paulson announced to the Board of Public Utilities recently that 281 ranges, 50 water heaters, 155 electric air heaters, 372 refrigerators had been sold and added to the lines in Alameda in addition to a number of improved lighting installations, of which no record was available.

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• GARDEN LIGHTING was featured at the Wapato Garden Club exhibition and flower show recently. Homer T. Curtis, lighting representative in the Yakima district, Pacific Power & Light, and Peggie Riley, lighting representative, had charge of the lighting for the display. Novel effects were introduced by the shading and concealing of lights and spot lights in gourds, birdhouses and bark containers. Paths were lighted from lamps concealed under jutting stones. Other lighting novelties were used to illuminate various blooms.

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• PROMOTIONAL ACTIVITIES of the Electrical League of Colorado and the Rocky Mountain Electrical Assn. are being studied by Miss Kathleen Robertson, associate editor of *McCall's Magazine.* A compliment to the two groups was selection of the area after consideration of all localities in the nation. Miss Robertson will first direct her attention to the current I.E.S. lamp campaign, gaining firsthand information from householders.

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• RANGE AND WATER HEATER TRIAL optional purchase plan is to be resumed by the El Paso Electric Co. this fall, featuring Westinghouse and Hotpoint ranges and water heaters. A similar campaign was held this spring. Ranges are installed for $1.95 a month, water heaters for $1.75 a month for 57 months. The campaign ends Dec. 31.

Some of the lighting equipment on display by representative manufacturers at the Lighting Conference of P. G. and E.

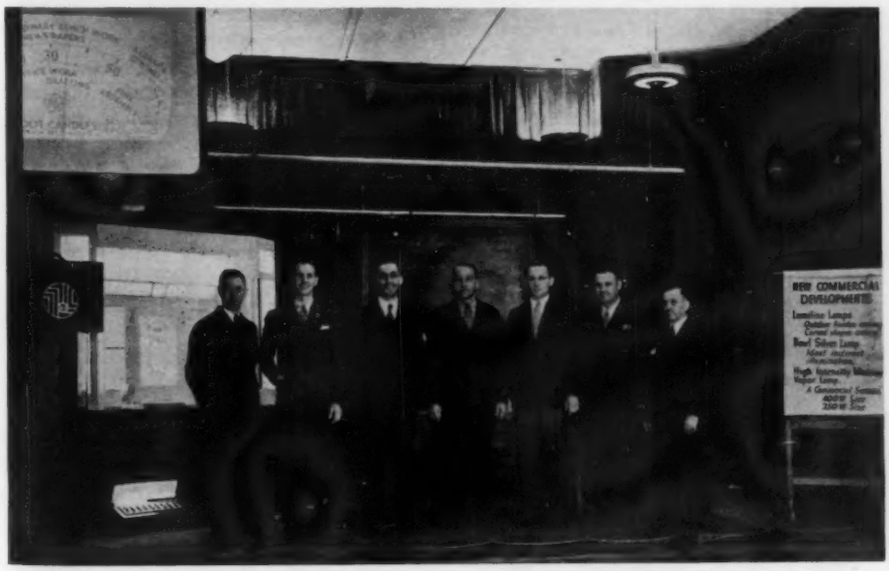
Conference Starts Lighting Drive

PRESAGING a season of exceptional opportunity for lighting installation and sales, a 1936 Lighting Conference was held by Pacific Gas and Electric Co. at its 31 Beale St. showroom in San Francisco late in August. Opportunities for selling and installation of new lighting sources, improved lighting fixtures and equipment were outlined as was the purpose of the four-day conference.

Under the direction of O. R. Doerr the instruction staff consisted of Leo Gianini and Walter Carlson, Incandescent Lamp Department, General Electric Co.; N. M. Albert, Weston Co.; John H. Maddox, Duplexalite; William P. Bear, Pacific Gas and Electric Co.; H. H. Robison, P. G. and E., Oakland; Jack Hammond, San Joaquin Light & Power Corp.; A. W. Ray, superintendent of schools, Sausalito; Harold Gerber, Department of Electricity, San Francisco; Art Johnson; K. K. Knopf and Walter Lind.

The first day's session was devoted to home lighting. It included a review of present conditions and immediate objectives, as well as future standards for home lighting. The Wednesday, Thursday and Friday sessions were devoted to commercial and industrial lighting, during which Leo Gianini demonstrated new light sources and their application and other lighting sales aids, such as the visibility meter and the new lighting handbook. A home lighting session similar to that conducted on the first day was later held in Sacramento for the benefit of combination domestic and lighting equipment salesmen from the Sacramento Valley and northern Sacramento Valley divisions.

Several of the speakers and instructors at the confrence. Left to right—H. H. Robison, Bob Dearborn, Leo Gianini, O. R. Doerr, A. W. Ray, George Curtis and William P. Bear



EHFA Appliance Credit Begins in Los Angeles

With appointment of the Los Angeles Bureau of Power and Light as the first Pacific Coast agent for the Electric Home and Farm Authority's financing plan, one of the biggest cooperative merchandising ventures ever undertaken is underway.

Besides creating thousands of prospects by the offer of low monthly payments on appliances, the EHFA plan is expected to add impetus to sales through regular finance channels and by cash.

Starting with full-page announcements in Los Angeles dailies, advertising of the campaign will extend to more than 80 publications and to other media. Dealers, who sell exactly as in the past, are afforded the opportunity to tie in.

Under the plan, the Bureau will accept purchase contracts through approved dealers, provided: the purchaser receives service from the Department of Water and Power, meets the usual credit restrictions, and purchases approved appliances so priced that a balance of at least $40 remains due after the down payment of 5 per cent.

The purchaser makes his first payment to the dealer and signs an application for EHFA financing. Following approval by the Power Bureau, the dealer makes delivery and receives the balance due from the bureau. The purchaser is billed with his monthly statement from the Department of Water and Power.

Five per cent interest, five per cent down payment and up to five years to pay are the basis of the offer. Approved electric water heaters and ranges are purchaseable on a 5-year basis. Refrigerators and ironers may be paid for over three years, while vacuum cleaners and washers are limited to two. In all cases the minimum monthly payment is $1.50.

A crew of 60 new consumer contact men is being fielded by the Bureau. Sales developed will be credited through cooperating dealers. The Bureau has not gone into the business of selling or distributing appliances.

The Bureau's application was the eighty-second to be approved by the EHFA. Purpose of the fund is to provide economical credit so that more families may benefit by low-cost electricity, through use of appliances purchased on convenient terms.

Spokane Store Modernizes I. E. S. Lamp Display

WHILE on every hand is heard the necessity for proper display of I.E.S. lamps, and particularly the "Lamp Fitting Room" as prerequisites for the successful selling of I.E.S. lamps, it is not often that either are found. Consequently, it is only natural that the executives of the Crescent department store in Spokane, Wash., point with pride to their recently remodeled portable lamp department.

Many features have been included with the definite intention of aiding the sale of "Better Sight Lamps." Such features include display tables remodeled to a standard height of 30 in. to conform with the expected usage of table model study lamps; partial ceilings over floor lamp displays at the standard height of 8 ft., 6 in. (under which I.E.S. lamps are tested and rated); all fixtures finished in white or very light colors to enhance the light output from the lamps on display.

Last, and most important, is a lamp fitting room with appropriate furniture for the proper use of both table and floor model I.E.S. lamps. Here a customer may sit in comfort under conditions similar to her own home and select the lamp she likes apart from the confusing array of designs on the display tables outside. Incidentally, the remodeling of this department included enlargement double its former floor space. A sightmeter and lighting literature are always available and a thoroughly trained homelighting specialist has been retained on the staff to aid in the merchandising of these more useful types of portable lamps.

A ramp between the old and new buildings of the store has been turned into an effective display space by the use of clever new fixtures and light colored walls and ceiling. All traffic between the two buildings uses this ramp. Prominently displayed over the archway at each end are the words "Better Light-Better Sight." This ramp leads to the Lamp Department on one end and faces the Gift Shop and the Beauty Parlor on the other end, giving it a fine prominence.

All walls and store fixtures are covered with a white DuPont fabric; the top surface with a light buff linoleum; trim in satin aluminum, including convenience outlets and hardware; and toe space in black, under the display tables.

All construction of new store fixtures and covering of present walls and floors were designed and executed by Ray Herring, display manager and his staff, with helpful suggestions from Erwin Freyer, Colonial-Premier Co., E. M. Bartlett, Mutual-Sunset Lamp Mfg. Co., and Ladner V. Ross, illumination engineer of the Washington Water Power Co.

Executives of the Crescent are most enthusiastic about the increased sales resulting from the new lamp department. They include J. L. Paine, chairman of the board, E. A. Shadle, president and general manager, H. D. Bacon, sales manager and R. L. Knowles, manager of the home furnishings department.

At top, ramp leading to the lamp department. Note the display in space formerly wasted. Center, the lamp fitting room where customers may try lamps in home surroundings. Bottom, general view of enlarged lamp department

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Inexpensive Kitchen Kits Available for Contests

Contests on kitchen planning have proved so successful in a number of cities that the National Kitchen Modernizing Bureau recommends similar contests in various kitchen modernization bureaus established throughout the West. In order to facilitate such contests a set of materials and primary instructions with which contestants may make floor plans to scale of their own kitchens without too great expense or too much labor have been prepared and are to be made available at a low cost.

Production, however, is conditional upon the extent of orders received. The kitchen planning kit at 8½ cents each will be made available if sufficient orders are received.

The kit consists of an envelope containing a folded sheet of bristol board for making walls and floor to scale. Other sheets of bristol board contain die-cut shapes which with a little paste or pieces of gummed paper can be fashioned into electric refrigerator, range, dishwasher-sink, water heater, working counters, base and wall cabinets, doors, windows, lighting fixtures, switches, convenience outlets, clock, fan and mixer for a miniature kitchen. Printed directions are likewise included. Kit envelopes may also contain the imprint of the kitchen modernizing local bureau at slight additional cost. Orders are to be placed with the National Bureau.

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• THE POLITICAL CAMPAIGN is being paraphrased by Edison General Electric Appliance Co. for its fall Hotpoint range and water heater sales campaign. All advertising carries slogans similar to those used in a political campaign and the "platform" consists of five planks, namely; coolness, speed, cleanliness, better results and economy. The unanimous decision of the Supreme Court of American public opinion is quoted, "After a fair trial and due deliberation, it is our unanimous decision that electric cookery thoroughly agrees with our constitutions."

Study Shows Low Cost Of Electric Heating

"How much does it cost to heat a room with electricity?" That this question might be answered with experimental facts rather than vague conjecture, Southern California Edison Co., Ltd., made a thoroughgoing study of 32 electrically heated homes and distributed the results in concise form to dealers and heating specialists throughout its territory.

General in scope and application, the study was presented as a guide which could be augmented by additional data meeting the conditions of a particular locality. It concerns three important points in regard to electrically heated homes:

1. Annual cost of heating the average home.
2. Annual return per kw. of connected heating load in the average home.
3. Saving in cost due to insulating the home to prevent heat losses.

Employing averages from homes in two groups, insulated and uninsulated, and presenting the results in kw.-hr., so they may be translated into cost according to the power rate, the study reveals:

	Group "A" 16 Insulated Homes	Group "B" 16 Uninsulated Homes
Average size of home:		
Number of rooms	8.7	8.7
Number of bathrooms	2.6	2.3
Average kw. connected load		
Range	9.6	9.3
Water heater	6.3	5.9
Heating	34.0	32.7
Total kw.	49.9	47.9
Annual kw.-hr. for heat per home	4,562	8,223
Annual kw.-hr. per kw. heat connected	134	252

Noteworthy in this table is the revelation that insulation will save 3,661 kw.-hr., or 45 per cent in heating, annually. Thus at a power rate of 1 cent per kw.-hr., the average annual heating costs are $82.23 for an uninsulated home, $45.62 for an insulated home. At this 1-cent rate, insulation would effect an annual saving of $36.61.

The average cost of insulating a home is usually from $10 to $50 per room, or from $80 to $400 a home of the size used herein. Thus, at the assumed rate, heating cost savings will pay for insulation in 2 to 8 years.

The insulated and uninsulated homes compared in the foregoing figures are similar in size and connected load. Noticeable is the fact that the insulated homes have a slightly higher connected load (34.0 as against 32.7 kw.), indicating that insulation was not taken into account when making the heating layouts. The apparent high figure for water heaters is occasioned by some of the homes having two.

Commenting on the data, the study makes this pertinent observation:

"In case the insulation warrants the reduction in connected load, the subsequent reduction in installation cost of heating equipment can be applied against insulating costs, materially reducing the total. It is therefore obvious that insulation pays very good dividends.

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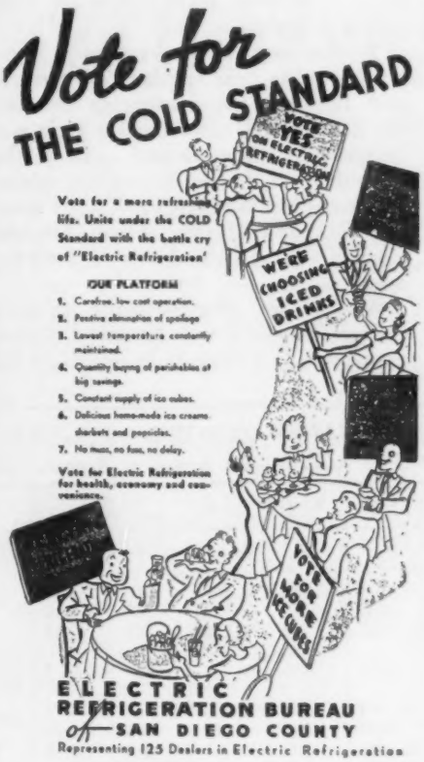
Elections Again


Vote for
THE COLD STANDARD
VOTE YES ON ELECTRIC REFRIGERATION
WE'RE CHOOSING ICED DRINKS
VOTE FOR MORE LEISURE
Vote for a more refreshing life. Unite under the COLD Standard with the battle cry of "Electric Refrigeration"
OUR PLATFORM
1. Carefree, low cost operation.
2. Positive elimination of spoilage
3. Lowest temperature constantly maintained.
4. Quantity buying of perishables at big savings.
5. Constant supply of ice cubes.
6. Delicious home-made ice creams sherbets and popsicles.
7. No muss, no fuss, no delay.
Vote for Electric Refrigeration for health, economy and convenience.
ELECTRIC REFRIGERATION BUREAU
of SAN DIEGO COUNTY
Representing 125 Dealers in Electric Refrigeration

General interest in elections was turned to good account by the San Diego cooperative dealers in a series of advertisements during their refrigerator campaign not long ago. A platform of sales points and support of the "cold standard" were the appeals to "voters"

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Run while interest in the state primary election was at its height was this outdoor advertising of the Southern California Edison Co., carrying out the ballot idea. Some 300 boards were posted in the Edison territory during July and August

Separate Meters Prove Electric Cooking Economy

MISTAKEN ideas as to the cost of electric cooking have blocked more than one sale of an electric range, according to salesmen. In order to meet this situation with actual facts and figures The Washington Water Power Co. recently made separate meter tests on a large number of residences. Startlingly low cost figures resulting from such tests were then presented to electrical dealers to use in their selling presentation. As printed in the September issue of *Electrical Sales News*, the separate meter tests show striking and irrefutable evidence of the amazingly low cost of electric cooking.

In the table below the monthly kilowatt-hour use on house meter and on the range only can be considered typical for any system. The monthly actual electric cooking costs column, of course, only applies on the rates of The Washington Water Power Co. but a similar set of figures could be worked up from any local rates. In all cases they would show electric cooking to be exceedingly economical.

Size of Family	Monthly Total Units (Kw.-hr.) Used on House Meter	Monthly Units (Kw.-hr.) Used on Range Only	Monthly Actual Electric Cooking Costs
3 adults, company for 2 weeks, baking	103	84	$2.52
3 adults, 1 child	70	45	1.35
2 adults	105	50	1.50
2 adults, 2 children use well above normal and canning	192	118	3.04
3 adults	126	53	1.59
3 adults	170	65	1.67
2 adults, 3 or 4 boarders	164	98	2.72
2 adults, infant	270	87	1.74
6 adults	201	81	1.84
2 adults, use oven frequently, bake own pastries, many oven meals	134	70	1.66
3 adults, maid, 2 children	448	154	3.08
3 adults, 2 children	243	135	3.04
2 adults, 1 child, company every Sunday	183	83	2.08
2 adults, 4 children	103	49	1.47
3 adults, use liberally	116	82	2.46
2 adults, 1 child	86	48	1.44
5 adults, 2 children, use liberally	238	109	2.31
3 adults	176	53	1.25
2 adults, 2 children	201	99	2.38
2 adults, 1 infant	192	72	1.66
2 adults, 1 child	106	38	1.14
2 adults, 2 children	84	42	1.26
2 adults, maid, infant	206	98	2.30
3 adults, 2 children	194	102	2.54
2 adults, maid, child, entertaining, canning	226	86	1.74
2 adults, 2 children do all own cooking and baking	116	60	1.80
2 adults (elderly), do all own cooking	44	29	.87
2 adults, 2 children do all own baking, canned 100 qts. beans	193	103	2.58
3 adults, use freely	180	69	1.69
4 adults	82	62	1.86
2 adults, 1 child	180	62	1.48
4 adults, use freely, warm 2nd dinner nightly	164	100	2.78
2 adults, 1 child	92	64	1.92
2 adults, 1 child	107	43	1.29
2 adults, 2 children	134	70	2.10
3 adults, 3 children, guests 3 or 4 times mo.	189	90	2.23
3 adults	161	79	2.18
2 adults, 1 child	73	47	1.56

Dealer Salesmen Draw Prizes From Sales Drive

Cash prizes to winners of the dealers' refrigeration campaign contest among salesmen, sponsored by the Electrical Appliance Society, San Francisco unit, were drawn at a meeting following breakfast Aug. 21 at William Taylor Hotel. Guy Farwell, Union Furniture Co., chairman of the San Francisco unit, presided.

Twenty-seven prizes were drawn on the basis of chances afforded the salesmen for each refrigerator sold and verified during the campaign. The month campaign resulted in the sale of 1,357 units which topped the previous record month of March. During the closing month offering F.H.A. terms 1,250 units were sold.

Announcement was also made that distributors had failed to get together on a campaign on washers and ironers previously planned by the Society for September. It was demonstrated by E. F. Perkins of P. G. and E. how cessation of activity causes total sales to drop. Up to May, during which a spring ironer campaign had been held, sales had been relatively high. After May the sales curve definitely dropped, indicating the value of stimulating campaigns.

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Utah Light Service Girls and Dealers Hear Plans

Preparation for the fall Better Light-Better Sight campaign took the form of an educational school for dealers and their sales staffs at Hotel Utah, Salt Lake City. It was held recently under the direction of Nancy Finch, supervisor of 46 home service girls for Utah Power & Light Co.

To discuss plans and exchange viewpoints and to hear speakers on eyesight and lighting, the convention between the dealers and home service girls was designed to stimulate and assist in the sale of I.E.S. lamps during the winter season. Fred Wolters, of Wolters Electric Co., and Murray Allen, commissioner for Utah's blind, were among the speakers.

A series of advertisements utilizing cartoons likewise was launched during September in a lamp bulb campaign involving both dealers and the utility. A goal of 10,000 cartons of lamps had been set for the drive.

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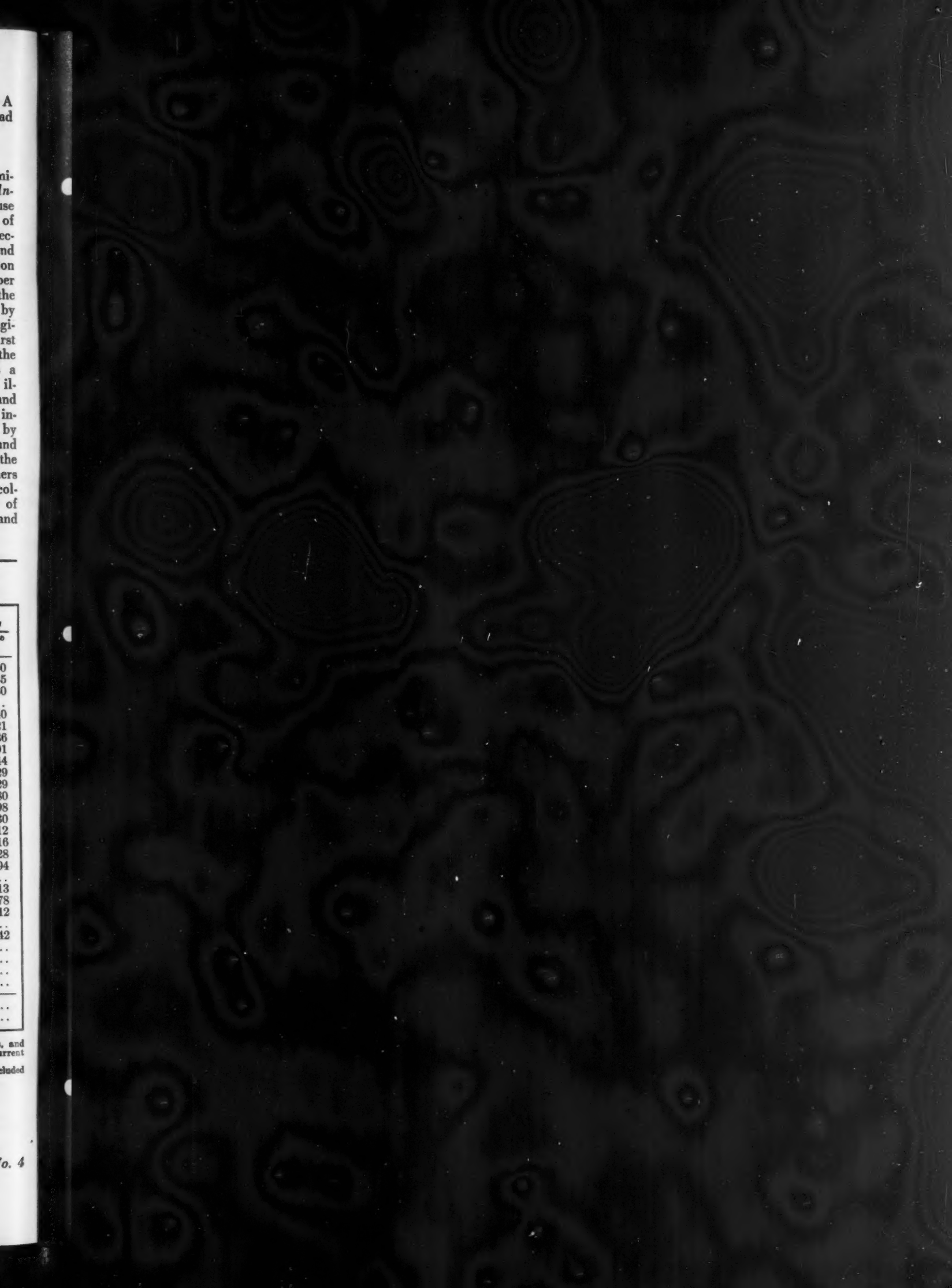
• A SUPPLEMENT dealing with illumination has been added to the *Los Angeles Electrical News*, monthly house organ of the Los Angeles Bureau of Power and Light, circulated to the electrical industry and to the architects and builders of the city. The illumination supplement is printed on buff paper and forms an insert in the center of the 8-page house organ. It is edited by Ted H. Shepherd, illuminating engineer for the Bureau, and made its first appearance in the August issue of the *News*. Like the *News* itself, it is a strong promotion piece for adequate illumination, containing pictures and short descriptions of outstanding installations or unique uses of lighting by customers of the Bureau of Power and Light, introduces personalities in the department and among the designers and lighting engineers and has a column by Frank A. Hansen, secretary of the Western Institute of Light and Vision.

DEALER SALES REPORT—AUGUST 1936

A Summary of Dealer Reports Compiled by Associations, Societies, Bureaus, or Dealer Contact Department of Utilities

APPLIANCE	P. G. & E. Co.[1]		San Diego Cons. G. & E. Co.[2]		San Joaquin Lt. & P. Corp.[3]		So. Calif. Edison Co., Ltd.[4]		Utah Power & Lt. Co.[5]		Wash. Water Power Co.[6]		Idaho Power Co.[7]	
	*Aug. 1936	Year to date	Aug. 1936	Year to date	‡July 1936	Jan.-July	Aug. 1936	Year to date	‡July 1936	Jan.-July	Aug. 1936	Year to date	Aug. 1936	Year to date
Ranges	371	2,704	40	370	142	1,051	395	4,268	262	2,358	314	1,706	223	3,130
Water Heaters	213	1,769	35	405	70	520	195	2,001	87	753	195	1,048	126	1,835
Air Heaters—aux.	95	4,438	30	795	3	114	26	802	17	571	33	669	4	180
Air Heaters, 220	88	563	.....	.....	32	383	.....	.....	.....	.....	.....	.....	.....	.....
Refrigerators	6,116	34,235	1,050	6,360	1,038	6,422	5,263	40,571	1,821	8,816	647	6,567	348	5,140
Dishwashers	16	193	.....	.....	3	12	.....	.....	9	47	.....	5	1	21
Washers	3,573	24,016	485	2,940	454	3,083	2,833	23,442	1,086	7,381	676	4,287	385	3,486
Ironers	876	7,129	90	615	80	612	496	4,689	47	363	49	472	31	391
Vac. Cleaners	2,340	17,952	175	1,365	108	661	940	8,084	770	4,190	164	1,655	64	844
Radios	7,936	63,161	950	7,300	487	4,035	4,153	35,569	1,066	8,050	1,369	8,217	329	3,729
Mixers	486	7,705	125	1,145	42	500	333	3,119	325	2,943	176	1,382	41	529
Cookers, Casseroles	.....	.....	75	465	125	213	64	574	28	125	552	3,019	13	80
Irons	.....	.....	350	2,880	425	2,499	1,417	11,370	1,456	8,992	806	5,445	355	2,898
Waffle Irons	.....	.....	150	1,340	99	762	358	3,367	483	3,135	211	1,452	50	830
Toasters	.....	.....	250	1,585	95	913	535	4,522	736	4,451	451	3,659	79	1,312
Table Stoves, etc.	.....	.....	50	340	86	991	244	2,172	2,066	7,646	156	1,326	71	1,316
Heating Pads	.....	.....	25	800	8	205	72	1,285	79	1,068	98	891	4	228
Curling Irons	.....	.....	.....	.....	.....	.....	28	364	540	2,365	.....	.....	77	894
Coffee Makers	.....	.....	165	1,665	92	702	272	2,767	486	2,984	413	3,150	.....	.....
Sewing Machines	1,220	9,811	50	390	.....	.....	.....	.....	201	1,053	44	545	8	113
Clocks	.....	.....	275	2,100	117	759	403	3,489	592	2,596	283	1,777	17	278
Fans	.....	.....	.....	.....	897	1,970	655	4,278	1,683	3,924	300	2,484	154	2,012
Floor Polishers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sun Lamps	.....	.....	.....	.....	.....	.....	6	536	2	66	1	26	1	42
Reflector Lamps	.....	.....	.....	.....	44	786	.....	.....	1,386	11,933	384	4,788	.....	.....
Misc. Lamps	.....	.....	.....	.....	.....	.....	.....	.....	1,379	11,670	1,174	7,667	.....	.....
Yard Lights	.....	.....	.....	.....	56	314	.....	.....	.....	.....	.....	.....	.....	.....
Misc. Small Appl.	.....	.....	.....	.....	261	1,768	698	5,782	.....	.....	.....	.....	.....	.....
Total Dealers	1,400	.....	.....	.....	.....	.....	539	539	.....	.....	.....	.....	.....	.....
No. Reporting	.....	.....	.....	.....	.....	.....	481	518†	.....	.....	.....	.....	.....	.....

[1] P. G. and E. reports obtained only on major appliances upon which accurate reports are available from dealers' accounts. Ranges, water heaters, and air heaters include company and dealer sales. Total dealers include gas as well as electric dealers. * Previous month's figures shown under current month's heading.
[2] Gathered by Bureau of Radio and Electric Appliances of San Diego County. Estimated monthly sales figures used in this table. Clocks, fans included under miscellaneous.
[3] Includes dealer reports from Midland Counties Public Service Corp. territory also. Compiled by Valley Electrical Supply Co.
[4] Includes reports from dealers on San Joaquin Valley system of the company as well as Southern California areas served.
[5] Includes Utah Power & Light Co. territory in Utah, Idaho and Wyoming. Also Western Colorado Power Co. territory.
[6] Dealer sales only for Spokane and company's territory. Company sales not included. Table stoves, grills included with cookers.
[7] Figures compiled by Electrical Equipment Sales Association. Include power company sales and sales of all reporting dealers—about 60% report.
† Arithmetical average of number of dealers reporting. ‡August report not available at time of going to press.



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ELECTRICAL WEST COOPERATIVE

SALES APPLIANCE ★ GUIDE

AUXILIARY AIR HEATERS

OCTOBER, 1936

. . . . Copyright, 1936, by Electrical West, 883 Mission St., San Francisco

Mass displays are especially effective in selling heaters. And at least one heater should be operating, or if in a window, simulating operation. In a store display the feel of warmth from a heater on a chill day is one of the best drawing cards a dealer can use

Follow Up Users

With a market that includes every home and practically every office, factory, service station, and other occupancy, there is plenty of opportunity for the original sale of good electric heaters. In spite of the large volume sold by the utilities during the past years this market is far from being saturated. The beauty of the auxiliary electric heater sale is that each one makes a demand for several more. Every home should have more than one. Look over the list of uses on the last page of this Guide and see why. Then call on former purchasers—either from you or someone else—and sell them another heater. Follow up each sale with a letter this Christmas suggesting an electric heater as a most acceptable Christmas gift to a member of the family or to a friend.

Sales Talk

Read the suggested sales talk on the inside two pages of this Guide. Note how Bill Smith, a capable salesman, turns into advantages to his prospect every sales feature of his heaters. Study the list of uses and the benefits derived from using an auxiliary heater on the last page and you too can meet sales obstacles and close orders.

●

Save this Sales Guide along with those published each month in ELECTRICAL WEST. *Keep them in a manual or binder for ready reference, for refreshing your memory as to sales points, hints on display and planning of your sales, and they will mean money to you. Next month—the electric kitchen mixer.*

Get Hot with Electric Heaters

One of Best Sources of Repeat Business for You

NOTHING in the entire line of appliances brings so much repeat business as the good quality auxiliary electric air heater. Perfect balance to the summer refrigerator, sales start in early fall, continue all winter and long into the spring. And for special purposes (see last page of this Guide for a list of these opportunities) it can be sold in summer too. Here is what selling these heaters means:

To the Dealer

A fast selling piece of merchandise with a quick turnover that means more profit.

Repeat business, for every house can use several. Those of good quality sell themselves for more per home. They make excellent gifts too.

Good margin on each one sold and good price maintenance, which means assured profit.

Satisfied customers who recommend it and who buy again. Good quality heaters have few "come backs" or burn outs or any service trouble at all.

Fine acceptance due to consistent advertising and selling of these heaters for many years in the West. Easier to sell, therefore.

Side line for the salesmen all year around, and an item they can sell in winter and keep up their income when refrigerators drop off. Thus the dealer can retain good salesmen and they can earn a steady income.

Home Demonstration

An item which salesmen can take from house to house and demonstrate, the auxiliary electric heater makes a convincing appeal. Manufacturers recommend organized selling crews, selecting prospects in better neighborhoods. The modern appearance of the heater attracts and gains admission. Its reputation brings prestige. Then the salesman can make a quick, convincing demonstration simply by plugging it in and letting the prospect feel the immediate effect of its heat. Its construction qualities should be translated into services to the customers, (as suggested on the last page of this Guide). By suggesting many of its hundreds of uses and conveniences the salesman can make it virtually indispensible to the prospect and close the sale, leaving the heater with the customer. Easy to carry, the salesman can thus dispose of a number each day. Where the utility advertises and displays such heaters, dealers and salesmen will be wise to follow up and capitalize on the acceptance thus created.

Trial Offer

By careful selection of prospects of good credit standing one successful method of selling a large volume of heaters is to allow prospects to use a heater for several chilly nights and days. The comfort they get from it will make it difficult to give up and selling will be easy. With the well made heater this involves practically no risk of maintenance or replacement since they are built to last years and a few days use is undetectable.

Terms if Possible

Since many utilities offer terms in the sale of such heaters, dealers will do well to offer similar terms. Again credit should be scrutinized and prospects selected. Many such customers coming monthly to the store to pay on the heater will be good prospects for other appliances when their payments are completed. Cultivate them.

Group Sales

When you sell a range, you can often sell a heater on the same contract. It will replace the heat in winter which came from the old stove, keep the kitchen clean, thus matching the new range in cleanliness, and make many a satisfied range user. Included in the contract with the range the payments will be scarcely noticed.

SALES TALKS THAT

• BRISK fall weather reminds Bill Smith, master salesman, that both fall and spring bring the need for convenient extra heat, and he knows that there is no superior to electric heat for this convenience and versatility. For mornings that are chill, in breakfast rooms, bathrooms, for the living or sewing room in the evening, he knows that an auxiliary electric heater should be in every one of his customer's homes. And all through the winter, there are many times and places that this convenient, safe, and really economical extra heater can be used with comfort.

Case History No. 23

Selling An Auxiliary Air Heater

Therefore, he has stocked an ample supply of electric heaters of reputable manufacture and sturdy construction, and advertised to his customers that he has the answer to cold feet, the cold bathroom, the chilly breakfast nook. A supporting display using attractive manufacturer sales helps in his window and in the doorway reminds passersby of their warmth and coziness. Mrs. Wallace, shopping that day, passes by, looks in, and then comes in to price heaters. She is not thoroughly conscious of needing a heater, but is interested.

MRS. WALLACE: "May I look at these heaters? Don't bother, I am just looking today. We really do not need one yet."

BILL: "Certainly. It's really no bother, for honestly I do like to show folks many surprising and beneficial points about these little heaters that might escape just casual observation. For instance, these nippy mornings, it is so cozy to have the instant feeling of warmth that comes from one of these little heaters, whether it be by your bed, in the bathroom, or at breakfast. With this little heater, you plug it into the outlet, and immediately the heat comes pouring out. No more dreading to get out of the warm covers. Your husband will enjoy his bath and shave in a cozy warm bathroom and be a lot more cheerful at the breakfast table, don't you think?"

MRS. WALLACE: "Perhaps so. Those are nice heaters, but I had in mind just an inexpensive one, one of those round ones that I've seen in other stores for around a dollar. Have you any of those?"

HOW many times has this situation been repeated for every dealer? Like all good dealers, Bill knows that such a heater will give only temporary service that often brings electric heating into disrepute. Yet shall he lose a sale by not having one on hand to sell if it is demanded? Notice how Bill handles this ticklish situation.

BILL: "One for around a dollar? H'm, yes, I could order one for you if it is really what you want, though I do not carry or recommend such a device for so important a household function. If you don't mind, I would like to give you my reasons. Electric heat is positively the cleanest, healthiest and safest heat there is and I would hate to have you disappointed in it because the heater you purchased was inadequate. Now with this type of heater there is an extra capacity to produce warmth, and it is so designed that every bit of it is immediately sent out to you to bring you comfort. I said it was clean. Notice how its heat is produced by clean electricity. Thus it is easy to keep it clean too, an item in housekeeping. Likewise, it is healthy, for no matter how tightly closed the room is, it gives nothing to the air but

Sold APPLIANCES

pure heat. Some people even use them for heat treatments for arthritis or rheumatism, since the heat is really infra-red radiation that penetrates deeply into the tissues."

MRS. WALLACE: "Is that so? It has many uses then?"

BILL: "That is the beauty of electricity, it is so versatile. This little heater has over a hundred uses. Just think, the same electricity that brings to your home electric refrigeration, electric cooking, and electric cleaning with your vacuum cleaner, also brings you instant warmth whenever and wherever you want or need it—midnight or daytime. Just to give you an idea of this heater's exceptional usefulness and versatility, let me suggest a few of its many uses to you in your own home. In the bathroom it helps to eliminate the excessive moisture and fogginess during a bath. It will warm the towels or dry your hair quickly. In an emergency it can be used to heat a little water, such as for your husband's shaving mug, or the baby's milk. It will warm the baby's clothes, or the children's; dry their wet clothes when they come in from play in the snow or when wet from the rain. If they take sun lamp treatments they need extra heat to compensate for the lack of clothing during the sun bath. If they are ill, often you'll want to keep the air of their rooms warmer than the rest of the house, and this little heater is just the ideal thing for such emergencies. Others have used them for all sorts of things requiring heat—such as drying paint, preventing mildew, protecting delicate plants, drying pets after bathing them; in guest rooms, dens, basement or attic rooms seldom used and not supplied furnace heat. And these heaters here are designed to direct the heat most usefully so that you get it where you want it. The extra quality built into this heater, which brings you an extra supply of warmth, uses your electricity more efficiently. It lasts longer and stands the abuse and accidents of housekeeping so much better because of its sturdy construction. That is what leads me to recommend this heater. *(Bill describes the mechanical details that insure long life, efficient heat distribution and safety.)* Why not let me wrap one up or have it delivered this afternoon so that you can get up tomorrow morning with the assurance of its greeting you with warmth and comfort? It is so good looking too. You can be proud to have your friends see it in any room in your house, which might not be the case with the flimsier kind.

NOTICE what Bill did there. He met the cheap competition frankly without knocking. Then he established the superior value of his own line by selling its quality construction features in terms of what these meant to his customer. Then he asked for the order tactfully to help his customer decide. Notice, too, how he threw in an added sales point after asking for the order, so as to boost the decision along over the obstacle of price. Appearance and pride are strong appeals if used at the right moment as Bill did here.

MRS. WALLACE: "Well, yes, if it won't cost too much to operate this larger heater."

HERE is a common misunderstanding. Bill does not dodge it either, but outsells it in the values of electric service.

BILL: "Cost too much? Well now, let's give that a thought too. I know how you feel about it and it is well to take it into consideration. The unique thing about electric heat is that there is no waste. Every bit of it is turned into pure heat. With a smaller heater, therefore, you have to use it longer to get the same effect, so it all comes out the same in the end. As for operating cost, the electricity it uses as a general rule will come into your lowest priced electricity, after your lighting and other uses are paid for and you are on the lower steps of the rate. If you are already using an electric range this cost will be still less, you see. Even so, for the convenience, the healthfulness, the cleanliness of this type of heat most people who really think about it thoroughly feel that it is well worth the cost. Honestly, at my house I never know whether it is because the days are shorter and I use more light, or that I use the heater now and then that my bill is a bit larger. But whatever it is I don't care much, for I am getting such a lot of comfort and happiness out of my electricity. Come to think of it, don't you find it is a real bargain? I'll have this heater delivered this afternoon and you can use it this evening to keep the chill off you while sewing or reading, and again in the morning. And I'd like you to tell me if you find it any different than I have described for I want to sell you another of these handy and convenient little heaters some day for other rooms of the house—save you from having to move them around a bit."

LIKE all good salesmen, Bill keeps on selling after the sale is closed and thus paves the way for repeat business.

CALIFORNIA OREGON POWER CO. • PORTLAND GENERAL ELECTRIC CO.
MOUNTAIN STATES POWER CO. • PUGET SOUND POWER & LIGHT CO.
PACIFIC POWER & LIGHT CO. • IDAHO POWER CO.
NORTHWESTERN ELECTRIC CO. • WASHINGTON WATER POWER CO.
UTAH POWER & LIGHT CO.

Attractive display material is available from the manufacturers of heaters both for window and store. Some manufacturers can supply a full line of advertising mats, bill stickers, radio spot announcement scripts, billboard posters and truck cards

Your Customer will Buy these qualities—

(Tell of them in your sales talk or advertising)

Comfort—

Brings the cozy warmth of instant heat wherever used. Takes away the chill and the dread of getting up, bathing, reading or sewing in a cold room. Brings cheer from comfortable surroundings.

Health—

Helps prevent colds by keeping warm. Warms a person quickly when chilled and wet. Free from any fumes and does not vitiate the air. Useful for heat treatments and during illness.

Safety—

Children may play around it. No danger from upsetting. When cold weather requires closed rooms, its heat circulates the air, keeps it fresh and never takes oxygen from it. Provides a safe way to dry clothes or anything else.

Economy—

Heats without waste of fuel. Costs nothing to install, very little to buy, and operates on the lowest steps of the rate. Saves starting the furnace in spring and fall. Heats only localized space required at the time.

Convenience—

So easily carried from place to place, it has a hundred uses about home or office. (See list on this page.) Is independent of storage of fuel. Plug it in anywhere.

Endurance—

Simple and sturdy, it never wears out. Can be tucked away in summer, used whenever needed. Attractive in appearance and long lasting in the everyday satisfaction it gives.

Sell Heaters for These

Commercial Uses

Box offices in theaters,
Toll stations,
Cashier's booths,
Cigar stands,
Small offices,
Telephone operators,
Elevators,
For directors' meetings,
Hotel rooms,
Resort cabins,
Hot houses,
Towel dryers,
Restaurant booths,
Doctors' examination rooms,
Artists' studios,
Watchman's towers,
Oil stations,
Hospitals,
Maintaining an even temperature for tropical fish,
Beer parlors,
Soda fountains,
Small stores,
Dressing rooms in beauty parlors,
Barber shops,
Radio stations,
Chemical laboratories,
Organ lofts,
Undertaking parlors,
Small rooms in lodge buildings,
Bank vaults,
Telegraph offices,
Fitting rooms in clothing stores,
School rooms,
Drying children's clothes in cloak rooms,
Sunday school classes,
Fraternity houses,
Localized heat in factories,
For changing relative humidity,
For apartments after the heating system is shut off,
Chiropractors,
Filing rooms,
Drying printers' ink.

In the Home

Sell heaters for

Bathroom

Quick warmth for shaving,
Adequate heat for the bath,
For drying towels,
Eliminating excessive moisture,
Heating shaving water,
Emergency heat day and night,
Drying hair,
Infra-red ray treatments,
Baking facial packs,
Drying wave set on hair,
Baking out sore spots.

Nursery

Warming baby's clothes before dressing,
To warm baby's milk at night,
For vaporizing cold medicines,
To warm bedding,
Safe heat for children at play,
Heating room for baby's bath,
Drying baby's clothes.

Bedroom

Quick heat for dressing,
For maintaining warmth during sickness,
For comfort while using ultra-violet ray lamps.

Kitchen, Breakfast Room

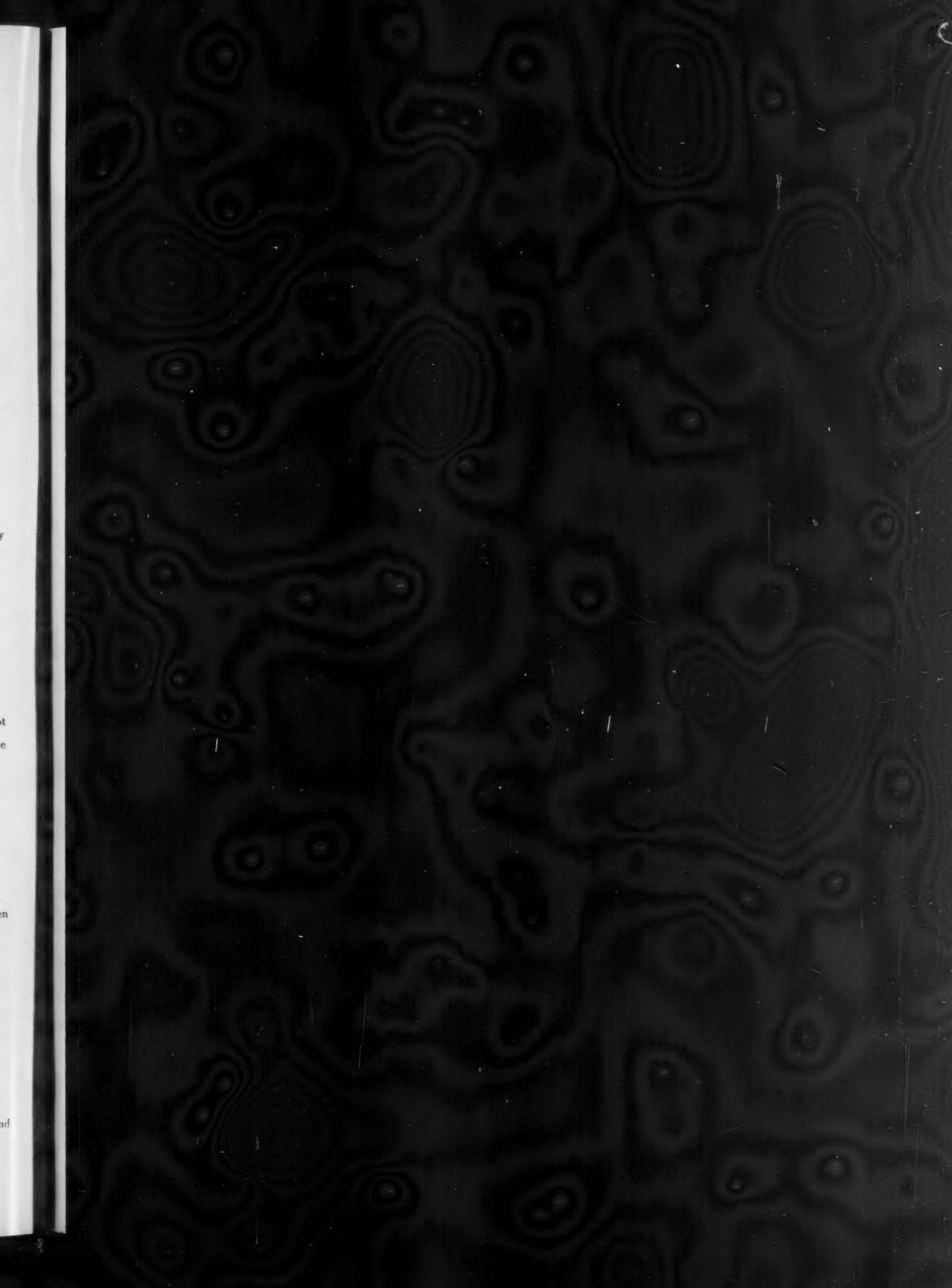
To remove the morning chill,
For drying clothes,
For raising bread,
For warming dishes,
To keep late comers' food warm,
For drying dish towels.

Living Room

Auxiliary to the furnace,
For piano practice when furnace is not operating,
To maintain the temperature after furnace is turned off,
For popping corn,
Toasting marshmallows.

General Household Uses

For damp laundries,
For drying wet shoes,
Thawing frozen pipes,
For the sewing room,
For drying out damp rooms,
To dry paint,
Additional heat for elderly people,
For vaporizing perfume water to sweeten the air,
Keeping pets at the proper temperature,
Guest rooms,
Dens,
Preventing mildew,
Warming poultices,
Drying photographic prints,
Removing gasoline odors,
Soften clay and wax,
Protect delicate plants,
Heat for attic rooms,
Relieving aching muscles,
For drying plaster,
For warming the workshop,
For drying pets after bathing,
For warming chilled feet,
To keep baby chicks warm,
In connection with repairing furniture and crockery,
Drying floor wax.



Bill Jones Speaks + + +

On the Universal Avocation

THE president of the Luncheon Club regretfully announced that the Program Committee had fallen entirely down and that therefore, in absence of any scheduled entertainment he would open the meeting for general discussion. There were a few desultory remarks from some members and then Dr. Smith rose and said:

"I think that some action should be taken regarding an unmitigated nuisance which I am sure you all have been subjected to. Several times a day the door bell rings and upon opening it Mrs. Smith is confronted with a pleasant gentleman who tries to sell an electric refrigerator, or an electric range, or electric laundry equipment or what-not. Every morning I have to gether up the hand-bills scattered over my lawn. It should be stopped."

"All forms of advertising should be eliminated," observed the attorney member of the club. "Advertising and salesmanship are devices to high-pressure people into buying things they don't need and which they can't afford." There was a small murmur of assent and then Bill Jones arose. He said:

"I suppose that if we were to undertake to compile a sort of 'Who's who' of this pleasant gathering we would find that really you constitute a cross section of the community—its intelligence and its activities. Probably you claim to be leaders of thought in our city; some of you are executives and big business men, and incidentals of that sort; a lot of doctors and lawyers and experts of one kind or another and I am pretty sure that we also have a varied assortment of people who really have to work for a living; and so forth and so forth, making up in all a fair representation of the callings and professions of here and anywhere.

"Now whatever you may call yourselves, actually you are engaged in a common pursuit — SALESMANSHIP. It is the universal avocation.

"The doctor is selling the idea of health; the clergyman the idea of peace and salvation; the clothing merchant is selling the idea of self-respect and comfort; the jeweler is selling the idea of self-adornment and personal possession; the college is selling the idea of enhanced opportunity and greater knowledge; and so on, and on throughout the entire range of human activities. Everyone of you gentlemen and institutions is just as much a peddler as is the chap who, in the Spring insinuates himself into your home and affords your wife an unparalleled opportunity to acquire a complete line of aluminum ware, or a history of the world in ten de luxe volumes.

"You gentlemen are selling all of these ideas, and many more, bundled together, wrapped up and labeled with that sometimes overworked and sometimes abused word 'service.' Therefore, it appears that our individual prosperity and progress, to say nothing of the regularity with which we eat, is quite largely dependent upon our ability as salesmen and advertisers and upon the desirability of the goods we have to offer on an already flooded and highly competitive market.

"So we start off with the proposition that each one of us is engaged in the effort to sell something—even though it be nothing other than himself.

"Salesmanship, real salesmanship, to be conspicuously successful, demands both imagination and hard work. I am well aware that this theory runs counter to that which has been promulgated by some very distinguished gentlemen, notably Ralph Waldo Emerson, who is credited—perhaps libeled—with having said something to the effect that if a man build the best mousetrap, though he live in the forest, the world will make a path to his door. Mr. Emerson undoubtedly possessed a very rare faculty of thinking—and what is still more important he had something with which to think—but I have yet to come across any evidence that he knew anything whatsoever about selling mousetraps.

"Lots of fellows can say nothing very convincingly. You who are practical salesmen know well that our hermit mousetrap builder would be able to build no more of his super-excellent article than he found necessary for his own requirements, for without salesmanship and advertising, in some form or other, its fame would reach no farther than the knowledge of its inventor, the cat and the mice themselves. Instead of a mad scramble, trampling down weeds and brush to reach that forest cottage, the world would be found indifferent, back turned, nonchalantly buying Spearmint chewing gum, Coca Cola and Chesterfield cigarettes.

"Honest advertising and honest salesmanship has done, and is doing, more to raise the standard of living than all of the New Deals or other social uplift movements that have ever been inaugurated and perpetuated, or are likely to be. The results are seen in increased leisure, greater comfort, better health, better education; the banishment of drudgery and the increase of happiness. It stimulates a sense of relative values; teaches economy and the fundamentals of economics. It brings within the range of the humble the luxuries of the rich. It is life—buoyant life. Its progressive and rippling circles reach near and far. Because of salesmanship and of advertising there came the safety razor blade and clean faces; the development of that same wafer razor blade made possible the thin and removable blade which appears in Dr. Smith's scalpel and in other cutting instruments at a cost otherwise impossible. It teaches better ways of doing old things; of doing new things cheaper and more effectively; shows how to avoid waste; how to conserve household resources, including energy. Today's salesman typifies progress—improvement. If those salesmen have annoyed Mrs. Smith by trying to place facts in her possession which are beneficial to her and to her home it is unfortunate, but if in their effort to sell her an electric refrigerator, electric range, and electric water heater they have made her conscious of the advantages and convenience to be attained by their use, he has performed a splendid service and a constructive service. For stimulating her pride in her household, improvement of her morale, increasing her self-respect is constructive in a very big way.

"Of course, there is salesmanship and salesmanship just as there is advertising and advertising. The same drug used by Dr. Smith as a heart stimulant may also be used by the criminal for the accomplishment of murder. But misrepresentation in selling talks and in advertising are easily curbed, and in

the end self-destroying. Our city has a very live Better Business Bureau which can help; the postoffice department and other agencies give considerable protection along these lines.

"The two gentlemen who have spoken, notwithstanding their protestations of virtuous indignation against the advertising and salesmanship of very meritorious things, are themselves persistent advertisers. Of course, the codes of their respective professions frown upon advertising and salesmanship, but I notice that when Mr. Smith signs a petition to the City Council; writes a letter to the editor of the newspaper about some civic movement; attaches his name to the list of 'those present' in a social affair, he takes considerable pains to see that the prefix 'Dr.' appears with his name. Why? No reason except the desire to do some advertising—publicity. When an account of a trial in our court appears I happen to know that Mr. Brown is quite sure to see that his name as defendant's attorney appears in the review of the case. Why? You answer that one. Both Mrs. Smith and Mrs. Brown have established more or less satisfactory connections which they cherish to insure that upon almost any pretext their names get into the social column. Why?

"And so, gentlemen, we stop about where we started: that each one of us is engaged in the effort to sell something—even though it be nothing other than himself."

Goodwill Building + + +

"With public sentiment nothing can fail; without it nothing can succeed; consequently he who moulds public sentiment goes deeper than he who enacts statutes or pronounces decisions."—Lincoln.

Service When Understood Creates Satisfaction

34 The last few years utility companies have made numerous drives to sell appliances in order to use more electricity. Their greatest concern has been to put the appliance into the home, and no effort has been made to see that it gives satisfaction.

The past year I have been much surprised to learn some of my friends' opinions.

One purchased a kitchen light, sold to her by a salesman from the local utility company—the light would not work in any socket in the house, and after failing to get any consideration from the local office, she discarded the light—with a determination never to buy another thing from the company.

Another, after having two waffle irons, which she insists never have worked, says, "You couldn't give her a toaster." She is an intelligent professional woman, yet she needs instruction in the use of appliances. Surely when these things are indispensable to thousands of others, they could be made so to her.

Two others have ironers which they consider it too much trouble to learn to use. They bought them from a "good salesman."

No doubt there are many dissatisfied customers who could, with a little assistance, be made into enthusiastic and satisfied ones.

Why not have a "check up" man or woman, equipped for small repair work, call at every home to see that appliances are in working order, and understood and used to their best advantage? Someone, with nothing to sell, calling in the interest of the housewife, would be a pleasant surprise, and would leave the housewife with the feeling that utility companies are really interested in having satisfied customers. —*C.D.L.*

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Try Some Comparisons With Other Necessities

35 The utilities are continually talking about the reductions that have been made in the price of electricity. Fine; it must be admitted that electricity is one item in the family budget that is cheaper than it ever was before.

But to be more effective, this advertising should be carried a step farther, to show that, while electricity has been going down, some of the other necessities of life have increased tremendously. Take the daily newspaper, for example. Let's look at the record.

Over a period of years, the Scripps-Howard "News" has increased in price from one cent a copy (25 cents a month) to three cents a copy (75 cents a month). This represents an increase of approximately 200 per cent of the original price. The morning papers, only a few years ago, sold for about 85 or 90 cents a month. This has been increased to $1.15, and at the same time the price of the Sunday edition has gone from five cents to ten cents a copy; a 100 per cent increase.

What an interesting picture could be drawn to illustrate these two examples of helping the family budget. Show in one column the downward trend in the price of electricity, and in another parallel column, show the upward trend in the price of newspapers, including the Sunday "funnies." A card showing this picture should be enclosed with every bill that goes to a utility customer.

Courage will build goodwill.—*C.A.G.*

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Rules

TO intensify interest in the problem of building customer goodwill ELECTRICAL WEST will pay $2.50 for each idea or suggestion deemed worthy of publication. In addition all suggestions received during the period from November 1, 1935 to October 1, 1936, will be eligible for $50 in awards to be given by ELECTRICAL WEST, the P.C.E.A. and the Northwest Electric Light & Power Assn. These awards will be based upon the goodwill building merit of the idea, its practicability, adaptability and originality. The judges will be officers of the two associations and the editors. The awards will be $25, $15 and $10 for the three suggestions ranked first, second and third by the judges. In the case of ties duplicate awards will be made.

Suggestions should be limited to 400 words, preferably less. Composition does not matter as manuscripts will be edited for publication by the editors. Ideas will be published over a nom de plume, provided the author indicates that such is his or her wish. They should be sent to the editor.

Employees Hold Key To Public Goodwill

36 It's a pity that many employees in relatively minor positions regard their work as just "a job" and completely overlook its importance to public relations. As a matter of fact, the employee who meets the public continuously wields more influence in the matter of good will than does the president of the company.

This is because the treatment the cus-

tomer receives from employees with whom he deals directly determines his attitude toward the company. And regardless of excellent institutional advertising and fine speeches made by vice-presidents, the consumer's final judgment of the company is based on the treatment he receives from the meter reader, the trouble man, the cashier who receives payment of bills, and the clerk who waits on him when he comes in the office to look at merchandise.

Friendliness, courtesy, respect, tact—these should outline all contacts an employee has with the public. A smile, a cordial manner and willing service can do a lot of good in making the customer feel kindly disposed toward the company. And it's just as easy to be pleasant as to be grumpy.

Isn't there some way to impress employees with this great responsibility? Such a realization will not only result in improved conduct which will help to promote consumer friendliness toward the utility company but also it will cause the employee to view his work in a different, more interesting light.—*M.S.*

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Rigid Rules Sometimes Should Be Waived

37 With the advent of the FHA, the building industry, which had long been dormant, immediately showed signs of life. With the passage of time building has increased. New buildings are erected and additions added to old ones. In many instances, particularly dwellings, such additions necessitate a change in the service contact point and in many cases, relocation of the meter.

For relocation of a service, the local power corporation makes a charge of $3.00. For relocation of a meter and service, the determining factor regarding the charge is the previous location of the meter and whether or not what is considered sufficient additional load has been added. In instances where the meter is relocated at the request of the corporation, the charge is, of course, waived.

Under a system such as this, it is difficult for Mr. Smith to understand why he is charged for an apparently identical service, which is rendered free of charge to his friend or neighbor, Mr. Brown. As a result he may feel quite badly and tell his troubles to his friends. Regardless, his goodwill is lost.

With the general adoption of new sequence metering and the definite revenue increase, through elimination of theft, would it not be a pleasant gesture in the interest of goodwill building, to make all meter changes, particularly where they are new sequence, free of charge?—*S. M. M.*

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Getting More Goodwill From Rate Reductions

38 Rate reductions register in a big way on the customer's goodwill complex. Let's make the most of such reductions when they do occur. The newspaper announcement or the folder accompanying the monthly bill inherently lack the emphasis that a dollar-and-cents figure for each particular case would have.

Suppose, then, when a reduction is being put into effect the consumer's monthly bill is made out at the old rate and the reduction shown as a discount on the old rate. Thus, where a consumer is billed for, say 72 Kw.-hr.:

Statement of Electric Service
for period June 1, to July 1

72 Kw.-hr.	@ 6c per Kw.-hr.	$4.32
Less 8 1/3% discount (½c per Kw.-hr.) on account of new schedule effective June 1		.36
	Net	3.96

This makes it quite clear to the consumer that reduced rates are actually in effect and that they apply to his particular case. It satisfies his curiosity as to how much the bill would have been under the old rate and how much the new rate is saving him.

This method of billing may be continued for several months or even a year, giving the utility the full goodwill credit due them for having reduced rates.—*F. S. L.*

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Small Courtesies Build Public Confidence

39 In a small cafe is a sign reading: "Coffee 5c per cup." However, when the cup is partially emptied it is refilled—the extra coffee being on the house. An insurance company takes occasion upon the anniversary of his birth, to greet each policy holder with an appropriate card, while a local jeweler celebrates each new birth with a letter of congratulation and a little ring for the new arrival.

And so it goes—everyone building goodwill. Yet in the power business, where consumer goodwill is vital to our continued existance, all the consumer gets is bills and stuffers. With every bill we seem to have something to sell but nothing to give.

What could be more appropriate upon the connection of a new residence to our lines, than a personal letter of congratulation to the owner, from the manager?

The addition of a range or water heater, or even the purchase of a minor appliance could be occasion for such a letter. And at Christmas time, what would be more acceptable to the average consumer, than a little memo book bearing the name or monogram of the local public service company?—*M. M.*

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Something for Nothing For Goodwill Promotion

40 Not long ago the writer observed a housewife, doing the family ironing with an electric iron, yet heating the iron on a gas stove. Another lady was industriously mixing a cake by hand while an electric mixer reposed on the back porch. Still another was using a carpet sweeper instead of her vacuum cleaner, while a truck farmer was pumping water with a makeshift automobile arrangement instead of his electric motor.

A cursory examination in each of the above instances disclosed a loose terminal in the iron, a "frozen" rotor in the motor of the mixer requiring only a little oil and cleaning, a worn brush in the vacuum cleaner and a broken wire in the motor.

A house to house call by a specialized employee *with nothing to sell* would undoubtedly disclose many similar instances. As encountered, appliances requiring no replacement of parts could be repaired, without charge and should parts be required, they could be supplied at the consumer's request at cost. Thus, the consumer would always get something for nothing (the labor) and while promoting goodwill, the power company would also be building additional load.—*S. M. M.*

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Focus Public Attention On Excellent Service

41 The utility companies might announce to the public through newspaper advertising or company publications sent out with the monthly bill, that they will give a prize (floor lamp, iron or other appliance) each month, to the person sending in the best example of exceptional service rendered by one of the company employees. It should also be stated that the employee will receive a prize.

The public's attention will then be drawn to the many cases of exceptional service performed by the company employees and they in turn will be striving to give good courteous service at all times. By having the public watching for examples of exceptional service the employees will naturally be more careful in their contacts with them. If all employees are "Good Service Conscious," there is no doubt but that public relations will be greatly improved.

By having the prize for the month on display in the showroom of the commercial offices the public will take an interest in them and many sales should result.—*F. W. B.*

With the Trade Associations + + +

[An Exchange of Plans and Ideas for Assisting the Industry in All Branches to Solve Some of Its Problems of Trade Relations and Business Ethics]

Adequacy Rules Proposed by Northwest Inspectors

RECOMMENDATIONS for changes in the articles of the N.E.C. vied with papers and discussions on subjects related to the work of Inspectors for the interest of the delegates to the Tenth Annual Convention, Northwestern Section, I.A.E.I. at Olympia, Wash., Sept. 14-16, 1936. The convention was presided over by M. P. Hotelling, deputy electrical inspector, State of Washington, and president of the Northwestern Section. A variety of entertainment features and other local arrangements were in the hands of representatives of the electrical industry of Olympia headed by Chester M. Kirsop, chief electrical inspector of that city. Exhibits by eighteen manufacturers and jobbers were a feature of the convention.

The subject of grounding received considerable attention at the convention, there being two papers on different phases of the subject and a spirited discussion on the Article IX Committee report. Harry E. Kemp, engineer of the Edison Electric Institute, New York, read a paper on safety features of multi-grounded rural circuits, finding the multi-grounded neutral system provides a low resistant ground connection in rural areas, with the neutral wire serving to interconnect all grounds including driven grounds for lightning arrestors, secondary distribution systems, and grounds on the customers' premises. Under the title "Protective Grounds," C. E. Ingalls of the Copperweld Steel Co., analyzed the elements going to make up a good ground by the use of driven electrodes. The report of the committee on Article IX presented by E. B. Morrison, Oregon Insurance Rating Bureau, Portland, chairman, recommended eliminating strap-type ground clamps for connecting the grounding conductors, but general discussion of the report took up the broader aspects of grounding. The convention passed a resolution sent on from the Western Section, that all ranges should be grounded to the neutral conductor where the secondary is grounded at two or more locations.

Most radical change in the Code suggested came from the Article XX Committee of which L. W. Going, chief electrical inspector, Portland, is chairman, in whose report an optional method of designing branch circuit layouts was proposed. The method proposed was on the basis of watts per square foot instead of outlets per circuit, and a loading of 1,000 watts per ordinary lighting circuit was set up for calculating the number of circuits required. The report listed occupancies in residence and commercial buildings with two ratings of watts per square foot for each occupancy, one a minimum safe standard and the other a standard of adequacy taken from the "Manual of Adequate Wiring" by N.E.M.A., Edition of April, 1936. An endorsement of this in principle was noted in the annual address of Ralph W. Wiley, International president.

The new editorial arrangement of the N.E.C. was explained by Victor H. Tousley, field secretary of the N.F.P.A., and secretary of the International Association of Electrical Inspectors. Many places where the provisions were clarified and the arrangement simplified were pointed out. The 1937 Code will be issued in this form. Among the resolutions passed at the close of the meeting was one commending those responsible for the editing and re-arranging the material in the Code.

The need of educating the public on the work of the inspector and the necessity of inspection was brought out in two papers, the first being the report of the Committee on the Investigation of Fires and Accidents by Captain S. E. Sanislo of the Seattle Fire Department, chairman. This report also emphasized the desirability of adequate records of the causes of fires so as to place factual information on hazards in the hands of inspectors. Supplementing this committee report a paper by J. W. Whittington, N.E.M.A., specified reasons why public education on the use of electricity should be practiced by the inspection fraternity and indicated many ways such a program could be carried on.

Another phase of education, that within the industry itself, was touched on in the report by J. Hyde Stayner, Utah Power & Light Co., chairman of the Utah Chapter, on the activities of this Chapter which was formed during the past year. The Chapter meets twice monthly and an analysis of a section of the Code is a feature of each meeting. Contractors and dealers are invited to the meetings, which have grown in popularity since being organized last February.

Other papers of considerable interest to the convention covered a description of radial wiring systems by A. B. Sparks, General Electric Co.; a comparison of the model State Electrical Law devised by N.E.M.A. with the laws of Oregon, Washington and Wisconsin, as presented by A. L. Abbott of N.E.M.A.; and an exposition of the work of Underwriters Laboratories by H. G. Ufer of that organization in Los Angeles.

The following officers were elected for next year: president, E. G. S. Pryor, resident engineer, Underwriters Laboratories, Seattle; first vice president, E. B. Morrison, Oregon Insurance Rating Bureau, Portland; second vice president, C. M. Kirsop, chief electrical inspector, Olympia; secretary-treasurer, Fred D. Weber, chief electrical inspector, Oregon Insurance Rating Bureau, Portland; and as representatives on Executive Committee: W. E. Leppard, inspector of electrical energy, Government of British Columbia, Vancouver; W. R. Volheye, chief electrical inspector of the state of Oregon, Portland; S. B. Clark, Northwestern Electric Co., Portland; S. H. Harrison, Westinghouse Electric & Manufacturing Co., Seattle; H. M. Sayer, contractor, Seattle; and George Pettingell, Fouch Electric Manufacturing Co., Portland. To represent the Section on the Executive Council, Harry A. Patton, Washington Surveying & Rating Bureau, Seattle, was elected.

Salt Lake City was chosen as the place for the 1937 convention. The Western and Southwestern Sections of the association have been invited to

join the Northwestern in a joint convention in that city.

Inspection trips offered to delegates to the convention included the Olympia Brewing Co. plant, the state capitol building, the Capitol Veneer plant, the Brenner Oyster Co., all in Olympia, and to the two dams and hydro-electric plants of the Cushman development of the city of Tacoma.

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"Special Permissions" Condemned By Southwestern Inspectors

APPLECARTS were turned over, new ideas in circuit breaker possibilities bandied back and forth, the new arrangement of the National Electrical Code taken to task for its fullness of "special permissions", and auto trailer houses considered as to their electrical hazards to life and limb, during the 13th annual convention of the Southwestern Section, International Association of Electrical Inspectors, Fresno, Calif., Sept. 21, 22, and 23, 1936. Aside from such important topics the section felt the pride of welcoming its own member and past president, Ralph W. Wiley, chief of the department of Electricity, San Francisco, as international president.

The calm and intellectual atmosphere usually prevalent at inspector association meetings was unpunctured until Monday afternoon. President C. Tom Coyle, city electrical inspector, Fresno, and secretary-treasurer Harold L. Gerber, department of electricity, San Francisco, had started the Monday morning session with precision. An appropriately beautiful tribute to deceased members Claude W. Mitchell and Carl Beaton—a minute of silence terminated by the distant trumpet notes of "Taps"—had opened the meeting. President Coyle's presidential report was brief, acknowledging the work and assistance of members and committees. Secretary Gerber's report had told of fine increases in membership and commended the Board of Fire Underwriters of the Pacific for unstinting assistance in office detail. Otis Newcomb, city electrician, Long Beach, had reported upon the excellent record of achievement of the Southern California chapter, of which he has been chairman. A. J. Snow, it had been announced, of Salt Lake City, had been appointed to fill the vacancy of chief electrical engineer for the Board of Fire Underwriters of the Pacific made by the death of late secretary Mitchell. Cliff Prudhomme, former contractor, had been introduced as new inspection chief for the city of Sacramento.

The remainder of the morning session had been devoted to reports from Wm. McFadden, speaking for O'Neill Barnwell, Beverly Hills; from Frank Short and George Kimball, electrical engineers of the California State Industrial Accident Commission as to fires and fatalities involving electricity. In Mr. McFadden's report, that of a comparatively new city, fires had been trivial and chiefly due to carelessness. He did bring up the problem of dissipation of exceedingly high temperatures that build up in totally enclosed built-in lighting fixtures. Inspector Tracy, of Redlands, had introduced a wild western note in his colorful invitation to all to attend the next meeting of the Southern California Chapter, at the Rainbow Angling Club, near Redlands, Nov. 18, 1936.

Fresno's electrical industry turned out to luncheon with the convention, at which E. J. Crawford, San Joaquin Light & Power Corp., presided and I.A.E.I. President Ralph Wiley, and Secretary Victor Tousley, Chicago, spoke briefly. That afternoon, Ben Hill, chief inspector, Oakland, chairman of the clearing house committee presented for action recommendations gleaned from all of the article committees as to changes or improvements of the next code edition. Service entrance cable was condemned, as was electric metalic tubing for outdoor service entrances. An alternate procedure was recommended for article 20 to permit adequacy provisions on branch circuit layout, as proposed by the Northwestern Section. Other reports were submitted to the executive council without recommendation.

Civil Service status for inspectors was the subject of a report by Carl Hardy, superintendent of electrical department, Oakland.

It was after these preliminaries that wirey little W. J. Tretheway, city electrician, Huntington Park, repeated a challenge he had made at a Southern California chapter meeting. He laid down the general proposition that as long as the code was being rewritten, no halfway job of it should suffice; that it should be so specifically rewritten that it would no longer require several books of interpretations, explanations, supplements, to make its meaning clear to inspector or wireman. Pointing to the practical situation wherein fire chiefs and others not familiar with the code are often called upon to inspect wiring, he asked how this could be done with a code filled with "special permissions" to ignore its rules on application. Exhibiting a display board on which were mounted four switches, each wired differently, he pointed to the inconsistency of the requirements which made each allowable. (Full text of this paper will be published later.)

Ralph Wiley, president of I.A.E.I., in a brief talk urging cooperation and greater adequacy likewise spoke frankly. Particularly he criticised consulting electrical engineers for skimping their plans in the mistaken idea that such methods benefited their clients. He then presented a charter to the Northern California chapter of the Southwestern Section. Its first chairman, A. V. Youens, city electrical engineer, Palo Alto, received it on behalf of the chapter.

Victor Tousley, secretary of I.A.E.I., commended chapter work as bringing to inspectors more frequent and closer contact, resulting in more uniform interpretation of the code. He urged study of civil service, and of inspectors' salaries as well as codes and ordinances.

Tuesday was circuit breaker day. Opening the morning session O. E. Keeler, switchgear engineer, Westinghouse, read a paper on application of circuit breakers to motor circuits. The subject broadened to use of circuit breakers for all types of circuits, although discussion in the paper and from the floor centered on the method of determining the circuit breaker size suitable to the motor, based not on horsepower rating but on load characteristics of the breaker, derived from tables published by manufacturers. It was pointed out that while breakers can sometimes be used as both a starter and switch, the type of starting current required by the motor should be considered in deciding such use. Mr. Keeler also told of new thermal protection built onto the motor to protect it from overload.

As a report from the publicity committee, W. A. Cyr, ELECTRICAL WEST, said that no one who attended the meetings of the association could fail to have respect for the thoroughness, the sincerity and truly democratic way in which every decision was arrived at, but that inspectors had a dual problem of acquainting both the remainder of the electrical industry and the public with the soundness of their decisions and rules.

J. W. Whittington, director of the Electrical Cord Manufacturers Assn., was then introduced. He too stressed the responsibility of inspectors to give publicity to the hazards of improper use of electricity as exemplified by a

tragic incident recited by Inspector McLean of Portland. "Why didn't you tell me of this danger," a frantic grief-stricken father had challenged the inspector who had investigated an electrocution of the man's daughter in a bathroom. Mr. Whittington then showed slides illustrating pictures in a new booklet soon to be off the press and which inspectors can use for wide public distribution.

Mr. Tousley next explained the new arrangement of the National Electrical Code chapter by chapter, admitted the faultiness of "special permissions" since inclusion of them renders a code less enforceable legally, but pointed out that the revision committees had been charged with strict directions to make no changes but merely rearrange its contents. The new arrangement, he said, would eliminate some "special permissions", be more specific, and require less interpretations.

Circuit breakers came back for a new interest in description of the radial wiring system, promulgated by the General Electric Co., and described by J. O. Dillingham. Establishing the vital need for far more adequacy in circuits and copper, Mr. Dillingham told of the unrealized loss in efficiency of lamps, sun lamps, vacuum cleaners, heaters, toasters, refrigerators, and in fact all appliances when voltage drop reached 10 per cent due to inadequate copper. The radial wiring system is one by which bus runs of No. 10 are tapped by means of numerous short runs of No. 12 wire for lighting and convenience outlets, each protected at the tap, instead of the meterboard, by the new small outlet box mounted circuit breaker which can also be used as a switch.

Choosing the dielectric was emphasized as the most important consideration in the selection of a cable, according to I. W. Borda, manager of San Francisco division, The Okonite Co., in a speech on "Non-Leaded Cables". Balance of several factors against each other should determine choice of any material, he pointed out. In his discussion he introduced the subject of service entrance cables and their wide acceptance in spite of objections from the contracting trades. Neither cheaper materials nor more profit to the contractor should be the measure of its use, he pointed out, but rather its potential service to the customer who wants to use more electricity, and whose desire for it is reflected in business to every branch of the electrical industry.

Breakfast sessions each morning gave inspectors an opportunity to exchange interpretations and ideas as to code enforcement and administration of their respective departments. Of particular interest was a discussion on Wednesday morning of new problems introduced by the trailer coach. Parking lots to accommodate such trailer coach camps are springing up everywhere, each offering electric service connections. How to safeguard the users of such service from accidental grounds was a moot question.

Applecart tipping was held over until the last morning when G. W. Price, county electrical inspector, Orange county, presented the results of numerous careful tests on effects of heavy salt moist atmospheres along the sea coast upon metal wiring systems. The protection of an all metal wiring system he declared, was destroyed by corrosive action which amounted to electrolytic action between two metals, even of like nature, suspended in a "fluid" of salt water fog. Electric metalic tubing he declared had a life of merely months instead of years in such atmosphere; conduit not much longer. Corrosion begins in four days on heavily galvanized conduit, he had observed, each hickey scar or other abraision being the first point of attack. He had also discovered that by imposing a positive direct current potential in a metal system that corrosive action was retarded. Exposure to light and sunshine, also seemed to increase the rate of corrosion, he had found. Flexible conduit or Bx, he told, corroded more in one position than another, due to moisture collecting in the crevices at the armor instead of rolling off. Interior partitions were less subject to such corrosion, and south and east wall exposures were worst. All-aluminum conduit and fittings on one job had shown least corrosion in 7 months. A rigid conduit installation spraved with reinforcing oil and turpentine likewise had shown remarkable resistance to corrosion.

Roy Cowles, engineer, Pacific Gas and Electric Co. gave a paper to end all papers on grounding, explaining carefully why grounding was done, and the problems encountered in obtaining satisfactory grounds in dry territory where water system grounding is not available. As a utility operating both an electric system and underground piping systems—both gas and water—he cited the experience of his company over many years as indicative of the relatively small damage ever done to water systems by grounding.

A. Penn Denton, engineer, Rigid Steel Conduit Industry, expressed real thanks to Mr. Price for his investigation of effects of fog upon conduit, promising the industry's support in such work. He then spoke of the general advantages of an all conduit wiring system not only from an electrical but from the standpoints of tamperability, resistance to mechanical injury, and resistance to atmospheric influences.

Arthur Abbott, uniform legislation department, National Electrical Manufacturers Assn., gave a scholarly analysis of state electrical laws in various states now in effect and presented a model law for any state contemplating such legislation. Glenn Slater, assistant registrar of contractors of the California Contractors License Bureau followed with an invitation to inspectors to make use of the contractors license law and of its field inspectors to help them in the enforcement of their codes and maintaining of standards.

Underwriters Laboratories was represented by actual demonstration of its field testing equipment, in charge of R. J. Larrabbe, and by a talk by Herbert G. Ufer, western superintendent. Mr. Ufer described the work of the laboratories, and announced many new labeling services, particularly on neon signs, as well as some discontinued standards. He warned that the presence of approved bracelet label cord on an appliance was not to be taken as approval of the entire device.

Winding up the speaking part of the program at the beginning of the afternoon session, Victor S. Hartley, executive director, Pacific Coast Electrical Assn. and Bureau, explained the difference between the functions of the association and bureau. He invited participation in the association as an all-industry forum in which all interrelated problems between one branch of the industry and others might best be harmonized, reading from the declaration of its president, Fred B. Lewis, that the industry must restore its leadership.

At the urgent request of the Northwestern Section, supplemented by a plea from President Wiley, the convention decided upon Salt Lake City for a joint convention with the Northwestern and Western Sections, next year. In the election of officers which closed the convention Harry V. Dobson, city electrical inspector, Santa Barbara, was named president; E. M. McLaughlin, Richmond, first vice president; W. J. Tretheway, Huntington Park, second vice president; and Harold L. Gerber, secretary treasurer. The executive committee includes the officers and Harry N. Beecher, Los Angeles, chief inspector; and C. T. Coyle, Fresno, as the two Active members; E. J. Crawford, San Joaquin Light & Power Corp., associate A; and Carl Heise, Westinghouse Electric & Manufacturing, associate B. Carl Hardy was named representative to the national Executive Council, and representative to the Electrical Committee, N.F.P.A., with R. H. Manahan, as alternate.

Engineering Symposium + + +

[A monthly forum in which engineers will present and discuss their problems, this department is dedicated to advancing the art of power generation, transmission, distribution and utilization]

Portable Trouble Finder Saves Time Locating Interference

By O. W. HURD
Northwestern Electric Co.
Portland, Ore.

LOCATION of radio interference in buildings, substations, and along power lines not possible to patrol by car, is made much easier for the radio interference engineer if he has an efficient portable trouble finder. The Northwestern Electric Co. has converted a commercial home receiver into a portable trouble finder that possesses the features desirable for this work.

The receiver chosen for conversion was a Stewart-Warner battery receiver Model R-128-D. The chassis of this set is small in size, making it possible to mount it in a carrying case 7½x7½x12½-in. overall dimensions. Another desirable feature of this set is that it tunes over a range of 550 to 20,000 kilocycles. The set originally had five tubes, but since only head phone signal strength is required the second audio amplifier tube was removed. By removing the second audio socket and moving by-pass condensers to the other end of the chassis, room is provided for batteries. With this arrangement it is possible to mount three 45-volt, V-30-AA batteries on top of the chassis, one 3-volt, P-2-KX battery and one 4½-volt battery underneath the chassis.

The chassis is mounted to an aluminum panel ⅛x7½x12½ in. on the bushings of the volume control, filament rheostat, and range switch. The tuning dial is made visible by cutting a window in the panel over the dial ⅜ in. wide and 1 in. long. A piece of celluloid is glued to the back of the panel over this window making it dustproof. A phone jack with filament switch, and a jack for the loop are also on this panel. A leather handle for carrying, located to give the correct balance, is also on the panel.

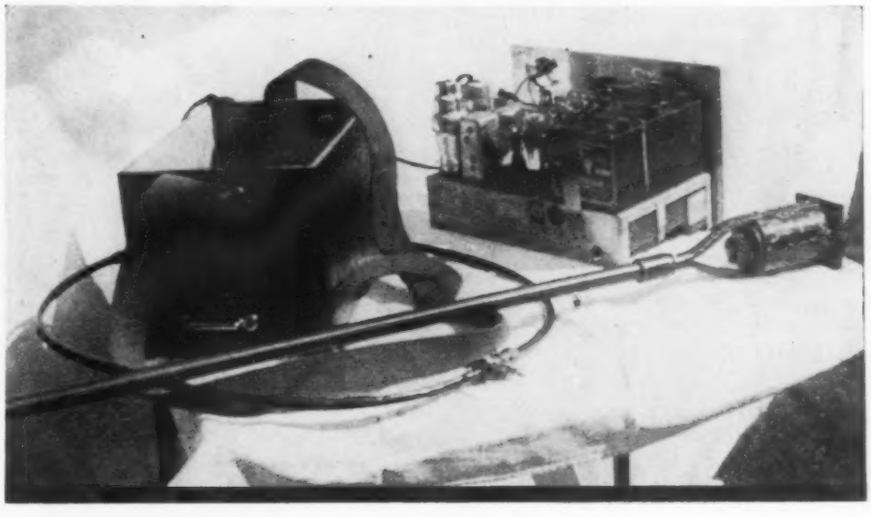
The carrying case is made of ¼-in. plywood for minimum weight. Strap guides are placed on the ends of the case for 1½-in. cloth trunk strap. These guides are also located to give the correct balance when carried by the strap. The weight of the outfit complete is 16 lb.

The only circuit changes necessary are the elimination of automatic volume control action of the second detector, and changing the connections to the antenna coils so that they are not connected to the chassis. Since the second audio tube is removed only 3-volt "C" battery is required. Tone control was removed and in its place was substituted a filament rheostat. The total filament battery drain is .24 amp. and maximum "B" battery drain is 6½ milliamperes. With this low battery consumption the shelf life of the batteries may be expected with the average amount of use.

To obtain the maximum efficiency from this set and to obtain very definite directional effect a special loop was devised. The loop is wound inside of a circular shaped fiber tube approximately 20 in. in diameter. The tube is of ¼ in. inside diameter and ⅜ in. outside diameter. This method of supporting the loop wires has the advantage of strength, durability and light weight. The loop is wound with seven turns of No. 22 d.c.c. enamel wire. The ends of the fiber tube are fastened to a standard brass ⅜-in. Tee fitting. This makes it possible to have loop and loop handle as separate units and also to use loops of various sizes on the same handle.

To improve the efficiency of the loop a tuning condenser is mounted in the handle of the loop. The capacity of this variable condenser is .000325 mfd, and bridged across the loop. To cover the range over which the receiver is capable of tuning it is necessary to have a maximum capacity of .0006 mfd across the loop. A fixed condenser of

O. W. Hurd, radio interference engineer, of the Northwestern Electric Co., demonstrating the portable trouble finder



Portable radio interference trouble finder showing the standard chassis converted for this purpose, together with the carrying case and special directional loop used as a pick-up

.0003 mfd is shunted across the variable condenser by means of toggle switch mounted in the same can.

A fiber tube handle is provided for the loop. The coupling between loop and receiver is through a two-conductor, shielded transmission line 10 ft. long. The transmission line connects to the second and sixth turns to secure the proper coupling.

Vacuum Tubes in Action

By H. C. STANLEY
Asst. Engineer, General Electric Co.
San Francisco, Calif.

THE electron is the work-horse of vacuum tube. Hence, in order to understand how vacuum tubes perform, we need at least a speaking acquaintance with the boys who are actually doing the job, i.e., the electrons.

Electrons are parts of the atom. They swirl around its nucleus, which is composed of one or more protons, usually mixed with electrons. The nucleus is a compact mass, and practically indestructible.

Protons are positive and electrons are negative. The atom normally has an equal number of each, making it neutral electrically. The outside or swirling electrons are held within the bounds of the atom by mutual attraction between them and the positive nucleus.

Electrons are so small that they can travel through so-called solids with consummate ease. If voltage is impressed across the two ends of a piece of copper wire, vast quantities of electrons will be torn from their moorings and dash toward the positive end of the wire. This concerted movement constitutes an electric current, which can be measured in amperes; 6 millions of millions of millions of electrons per second for each ampere.

If a piece of metal is heated its electrons are excited to great activity, and as the temperature is increased they eventually attain sufficient speed to break through the surface. But once outside they encounter the molecules of the air, which put a stop to their activity. This brings us to the subject of vacuum tubes.

We will now heat our piece of metal in a chamber from which the air molecules have been pumped. This vacuum has two important functions, first, it provides a play-room for the electrons which are driven from the metal and, second, the metal can be heated to a high temperature without burning up. An ordinary incandescent lamp would burn out immediately if air were admitted inside the bulb.

The piece of metal in our vacuum tube can be made of fine wire, similar to the filament in the incandescent lamp, and heated by an electric current. This filament is usually made of tungsten so as to stand up under the high temperatures necessary to drive out vast swarms of electrons. If we place in our vacuum tube another piece of metal and apply a voltage between this piece of metal and the filament, electrons will pass from the filament to the piece of metal when the following conditions obtain.

1. When the filament is heated to a high temperature.

This is the first of a series of short articles on vacuum tubes. The series will constitute a concise statement, in Mr. Stanley's clear, original style, of their main uses and of the fundamentals governing their operation. To the non-technical man, the series offers an opportunity to acquire, with minimum effort, a working knowledge of these important units in modern electrical engineering, units which are usually described only in a highly technical fashion. To those versed in electronics, the series will offer an illuminating review from a fresh viewpoint.

2. When the piece of metal has a positive potential in respect to the hot filament.

No electrons will pass unless the piece of metal is positive in respect to the hot filament, and no electrons will pass unless the filament is hot. No electrons will pass from the piece of metal at any time because of its low temperature. Therefore our vacuum tube is strictly a one-way device as far as the passage of electrons is concerned.

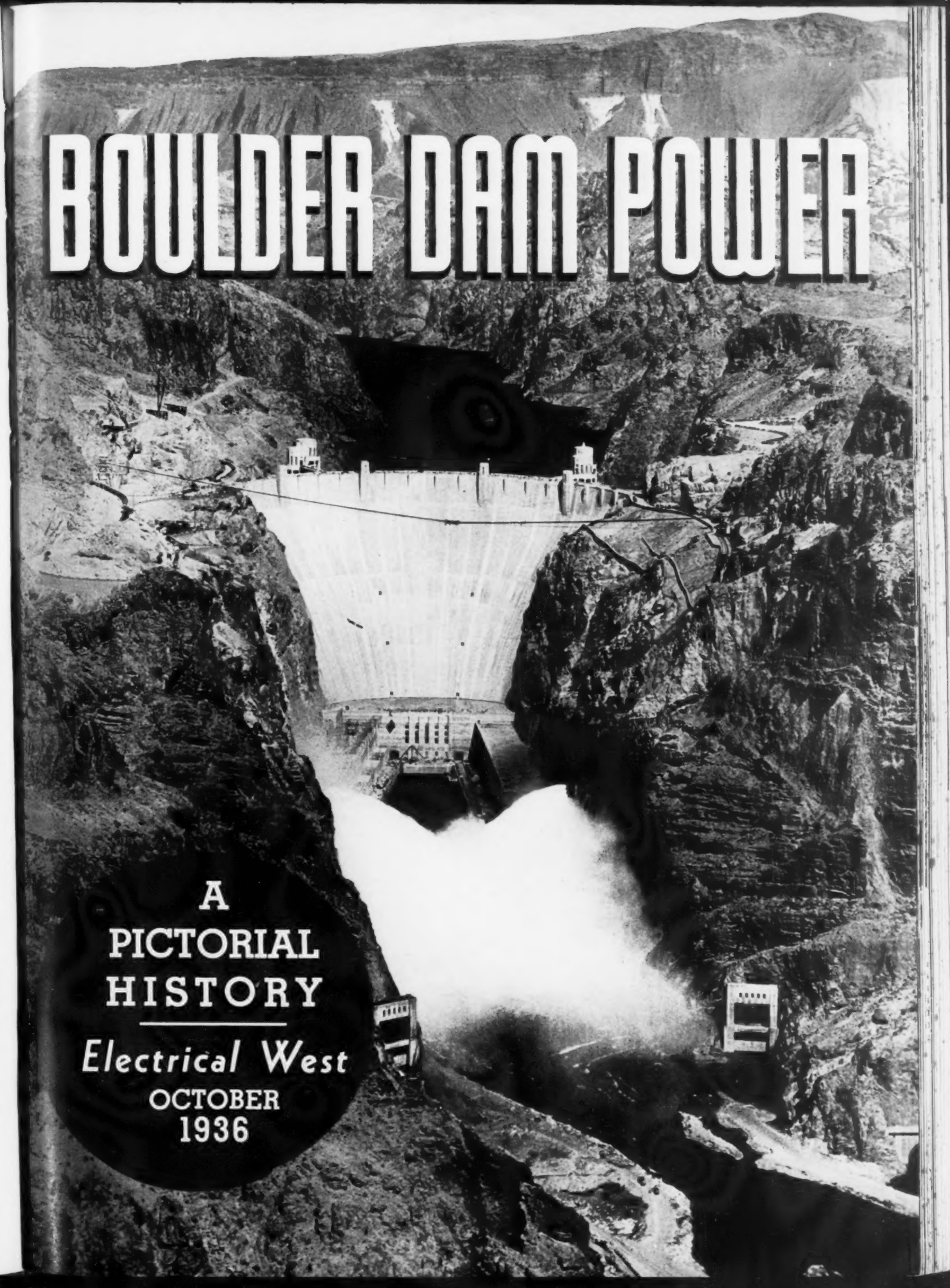
The hot filament is called the cathode. The cold metal is called the anode or plate. This combination is called a two electrode hot cathode vacuum tube.

If alternating voltage is applied across the two electrodes, a passage of electrons will take place only when the anode is positive, and therefore alternating current is rectified to direct current, and our tube becomes a rectifier.

Upon emission of electrons from the hot cathode of a vacuum tube, the electrons find themselves in a space suitable for any activity that might be offered. Their chief desire is to travel to points of positive potential. An important fact is that it takes but little voltage to attract them. However, in case of heavy emission of electrons and low anode voltage, all the electrons cannot reach the anode, due to congestion. A negative space charge is set up by the electrons themselves which offsets the attraction of the positive anode. This negative space charge can be modified by placing a third electrode between the cathode and the anode. This is called the grid. If a positive potential is applied to the grid, it neutralizes the negative space charge and results in a greater flow of electrons to the anode. If a negative potential is applied to the grid, no electrons will pass to the anode. Thus the grid acts as traffic officer. Assuming constant emission of electrons and constant positive potential on the anode, the grid is able to govern the current in the tube from zero up to the maximum tube output. The grid does not have to pass current, but merely maintain a voltage, so that the required input to the grid is very, very small.

We now have the famous three-electrode tube such as is used in the home radio receiver. The exceedingly weak source of current available on the antenna is connected to the grid, the A battery heats the cathode and the B battery provides the positive potential for the anode. The flow of electrons through the tube follows faithfully the variations of voltages applied to the grid. This flow results in a substantial current, so that our three-electrode tube is an amplifier. The anode output of the first tube can be connected to the grid of a second tube, thus accomplishing a second stage of amplification, and so on to any required degree.

In modern radio receivers vacuum tube rectifiers replace the "B" batteries as sources of direct current and the tube filaments are heated by alternating current, making "A" batteries unnecessary. Screen-grid tubes are also used. These have a second grid which merely supplements the control grid. Tubes having high vacuum will amplify weak signals with great fidelity but are limited in the amount of current that will pass between the cathode and anode. Their most important use is in communication circuits where extreme sensitivity is important. Next month's article will discuss tubes which have a power output.


BOULDER DAM POWER
A PICTORIAL HISTORY
Electrical West
OCTOBER 1936

FROM DAM SITE TO

POWER from Boulder Dam.—A dream has become a reality. Across Black Canyon, some 30 miles southeast of Las Vegas, N. M., stands a mighty 726-ft. steel and concrete barrier impounding the waters of the great Colorado River in the natural reservoir created by centuries of its erosive action. By this massive piece of modern engineering, the waters of a 240,000-sq. mi. drainage area are diverted from wasteful and destructive liberty to useful and economic purposes.

From the engineering standpoint, the project is a study in superlatives. Boulder Dam is the highest yet constructed and creates the largest man-made lake in the world—a reservoir 115 miles long and containing 30,500,000 acre-ft. or an amount sufficient to provide 5,000 gal. for every human being on earth. Boulder power house, constructed just below the dam, has an ultimate capacity of 1,350,000 kva., by far the largest concentration of generating units in the world. For sheer size alone, the project would be of outstanding interest, but more important still are the economics involved in the effective utilization of Colorado River water and the pioneering in advanced engineering principles which paves the way for still greater achievements.

At the Black Canyon site, 30 years' stream gage records reveal an average runoff of 15,700,000 acre-ft., the maximum and minimum annual flow being 24,000,000 and 7,000,000 acre-ft., respectively. Characteristics of the river are its tremendous runoff, the high silt content of its waters, and the suddenness and severity of its floods which have dealt death and destruction in the Imperial Valley area.

As set forth in the authorization passed by Congress on Dec. 21, 1928, the purposes of the Boulder Canyon project were: (1) to regulate the flow of the Colorado River, provide adequate irrigation water and silt control for the rich farming areas in south-western Arizona and south-eastern California; (2) to insure an increased domestic water supply for municipalities of the Pacific southwest and to control release of stored waters for the above purposes, and (3) to generate power for sale to various distributing agencies in the surrounding states. Contracts for power and water sales at rates calculated to amortize the $165,000,000 principal and accrued interest over a 50-year period were consummated with these various agencies before the construction was started, thus insuring repayment to the federal government of the expenditures involved in the construction of the project. Corollary developments, made possible by Boulder Dam, are the $38,500,000 All-American Canal project (the cost of which is included in the above figure) required to bring Colorado River water into the Imperial Valley for irrigation and the $220,000,000 Colorado River aqueduct now being constructed by the Metropolitan Water District. The aqueduct will pick up 1,500 sec.-ft. from the river 150 miles below Boulder Dam and convey it across the desert some 290 miles to the coastal area of southern California.

Not all of the 30½ million acre-ft. of the reservoir behind Boulder Dam is useful storage. Nine and a half million acre-ft. must be reserved at all times for flood storage; 5 to 8 million acre-ft. reserved for a silt pocket, leaving only 12 to 15 million acre-ft. as dependable, active storage to release to the power house service. Based on a 16,000,000-acre-ft. average annual release for all purposes, at the average head of 530 ft., 4,330,000,000 kw.-hr. of firm energy (equivalent to 665,000 continuous horsepower) and 1,550,000,000 of secondary energy would be produced by falling water.

Based on the 16,000,000-acre-ft. annual runoff, water allocation was made as follows: 7,500,000 acre-ft. to the upper basin states, and 7,500,000 acre-ft. to the lower basin states, with the right of the latter to increase their beneficial consumption use of such water by 1,000,000 acre-ft. per year. California is given the right to use one-half of surplus water available above 7,500,000 acre-ft.

Contract price for firm power is 1.63 mills per kw.-hr. for falling water delivered at the power house transmission voltage and 5 mills per kw.-hr. for secondary power delivered at the power house transmission bus. The annual income from the sale of power and water is expected to be $7,400,000, of which $6,550,000 comes from firm power, $650,000 from secondary power and $250,000 from water sales. At this rate the gross income of $351,000,000 over a 50-year period is expected to return the principal and interest on the original investment, permit a sinking fund to take care of depreciation, pay the operating and maintenance expenses of the structures and provide a surplus which is to be allocated 62½ per cent to the United States and 18¼ per cent each of the states of Arizona and Nevada.

To the United States Bureau of Reclamation fell the responsibility for the design, supervision of construction, and the actual installation of all the machinery and apparatus in the dam, spillways and power house. Actual construction was carried on by the Six Companies, Inc., a San Francisco organization, on a labor contract basis.

That the first power from the project was generated just slightly over 5 years from the date of starting the diversion tunnels and 2 years ahead of the schedule is a tribute to the efficient coordination and careful engineering that has characterized the project from its inception. In no other way could such record-breaking progress have been made in the face of the tremendous natural difficulties which characterized the location.

Modern engineering conquered these difficulties. Modern construction equipment permitted man-power to be utilized more effectively than ever before. Advanced design made the utilization of Colorado River energy economically feasible. Those who worked upon the project, watched it rise to the magnificence of its completed shape, lived its progress from day to day, can fully appreciate its magnitude and the multiplicity of details its successful completion represents. As a permanent record of construction technique and engineering design employed from dam site to completion, Electrical West presents this pictorial history of the project.

Boulder Dam Power Distributing Agencies

Company	Firm Power Contracts (Kw.-Hr.)	Approximate Annual Payment at 1.63 Mills
Southern California Edison	917,000,000	$1,495,000
City of Los Angeles	1,485,000,000	2,420,000
Los Angeles Gas & Electric	114,000,000	185,000
Southern Sierras Power	114,000,000	185,000
Pasadena, Glendale, Burbank	174,000,000	284,000
Metropolitan Water District	1,526,000,000	2,481,000
Total	4,330,000,000	$7,050,000

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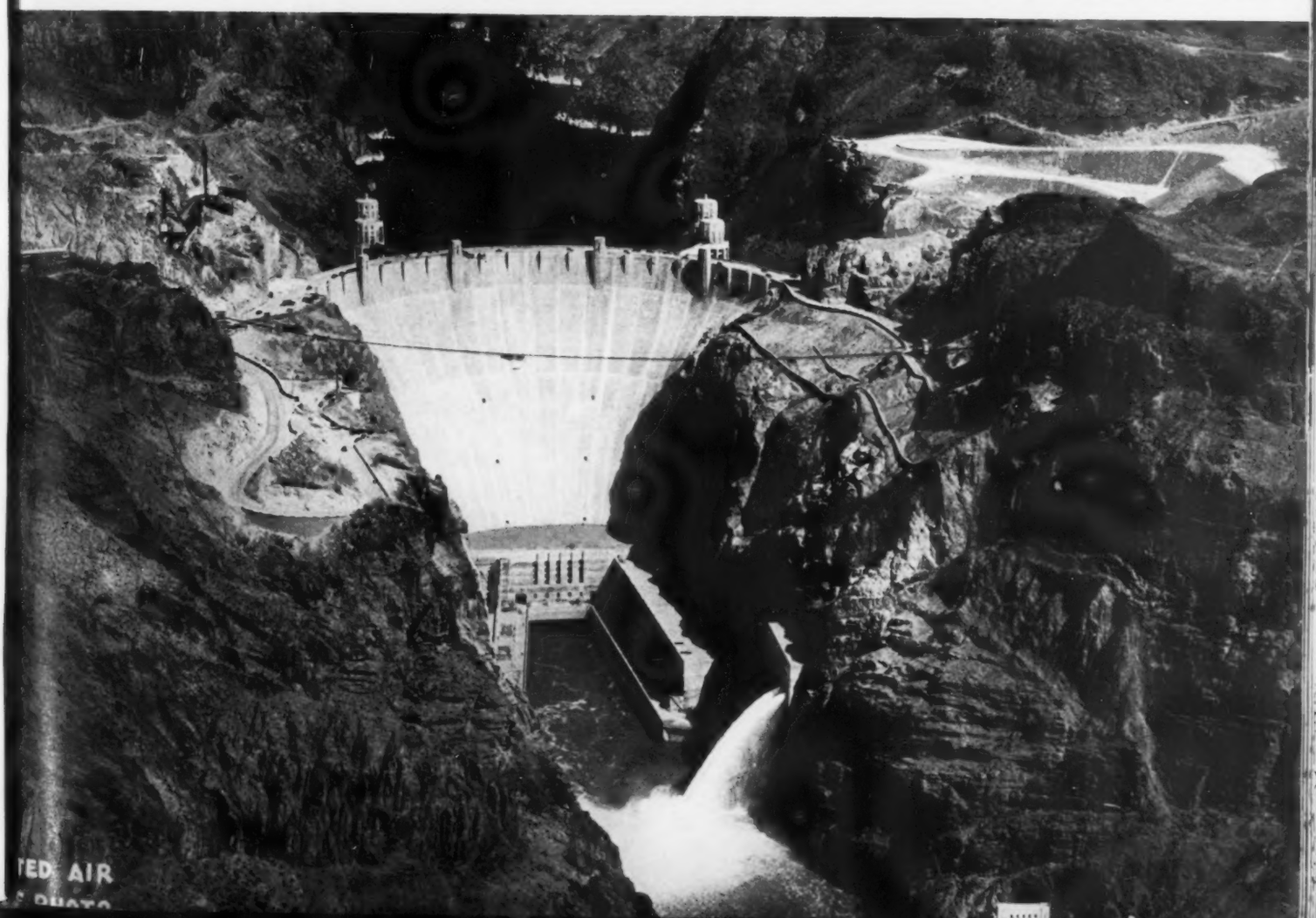
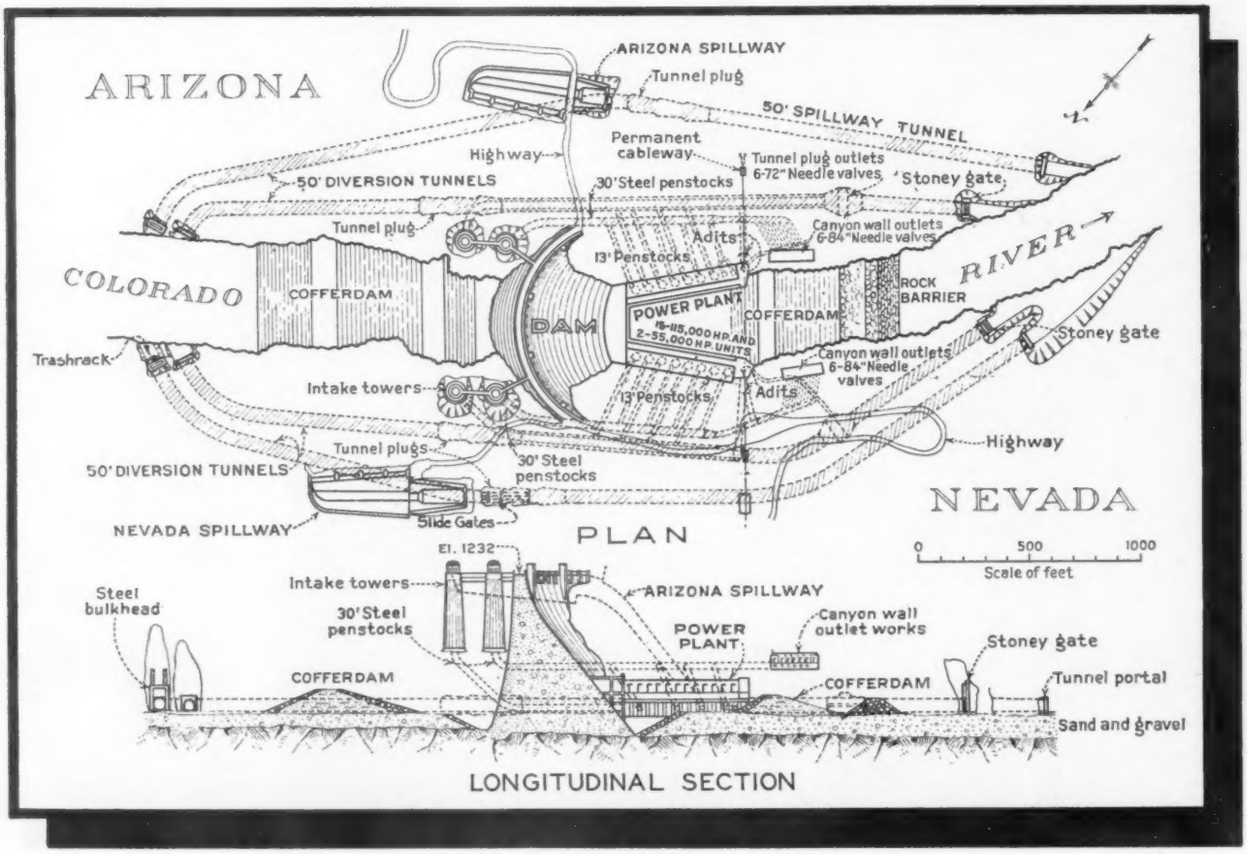
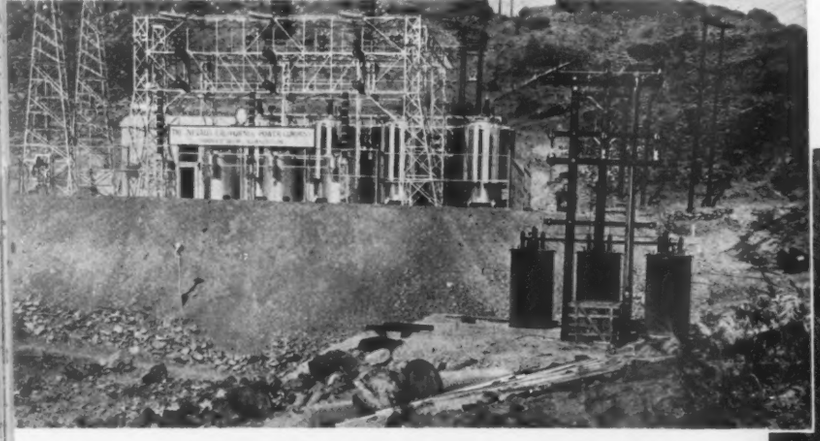


PRELIMINARIES . . .



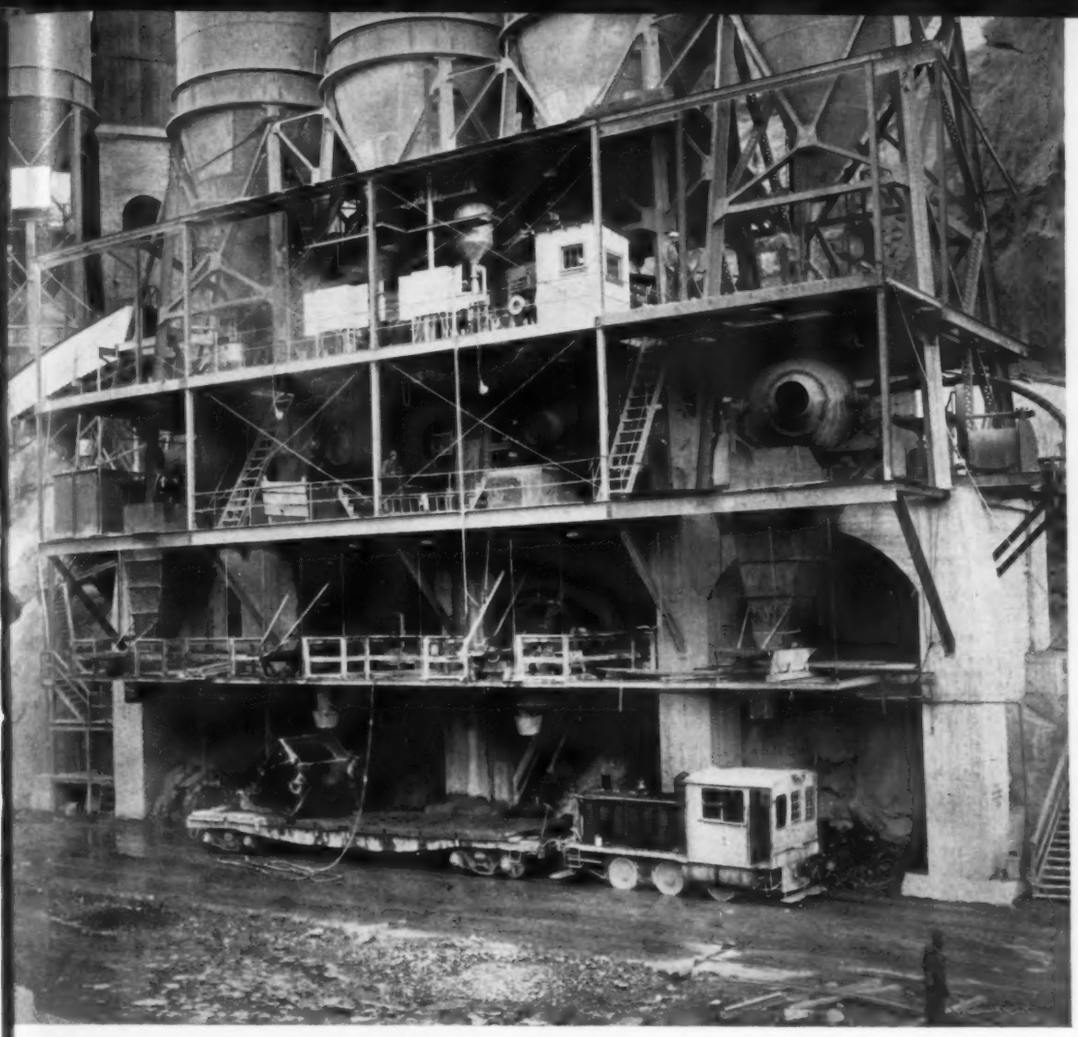
General Plan and Longitudinal Section of the Boulder Canyon Project. First constructed were the four 50-ft. diversion tunnels, two on either side of the canyon at Elevation 649. Upper and lower coffer dams permitted unwatering of the construction site, the river flow being carried around the project in the diversion tunnels. The outer diversion tunnels later were connected by inclined shafts to the spillways and plugged upstream from the entrance of the tunnel connecting the spillways to the diversion tunnels. Thirty-foot steel penstocks are installed in the inner diversion tunnels connecting the upstream intake towers with four branch penstocks supplying four of the main generating units in each wing of the power house. The penstocks then continue to discharge chambers in the diversion tunnels where six 72-in. needle valves permit release of additional water other than that passing through the turbines.

At Elevation 820 ft. in 37½-ft. diameter tunnels on both sides of the river are installed 30-ft. diameter steel penstocks connecting the downstream intake towers with the remaining four branch penstocks in each power house wing. The upper penstocks continue to the canyon wal' outlet valve houses down stream on either side of the canyon way and terminate in six 84-in. needle valves. Each spillway can handle 200,000 sec. ft. of water, the four sets of needle valves 100,000 sec. ft. and the fifteen 115,000-hp. turbines and two 55,000-hp. turbines, 25,000 sec. ft. making possible a total release from the reservoir of 525,000 sec. ft.



Construction Power had to be transmitted 222 miles from San Bernardino, Calif., over a 110-kv. transmission line built for the purpose by the Southern Sierras Power Co. This is the substation built on the canyon rim above the damsite from which power was supplied for all construction activities and for the requirements of Boulder City, seven miles away.

Unwatering the damsite preparatory to excavating to bed rock. The river may be seen entering the two inner diversion tunnels which discharge the flow below the downstream coffer dams.



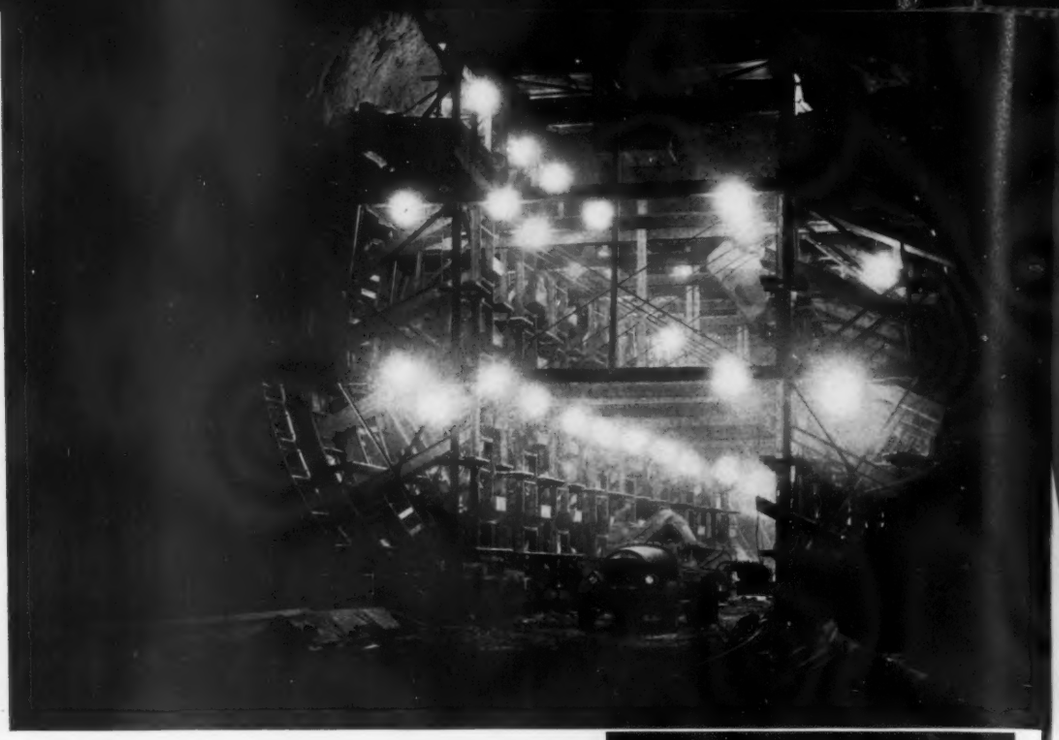
Concrete Mixing Plants were vital as the project required 4,200,000 cubic yds. of concrete. Skill in design and operation were essential to enable rapid delivery of concrete. This view of one of the two main batching plants shows, at the top, the main storage bins for cement, sand and aggregate. Proportions were weighed at the top platform, dropped into four 4-yd. mixers immediately below and emptied into hoppers for delivery to concrete buckets carried on flatcars at the ground level. Operations were practically automatic, making possible delivery of 2,200 yd. of mixed concrete per shift.

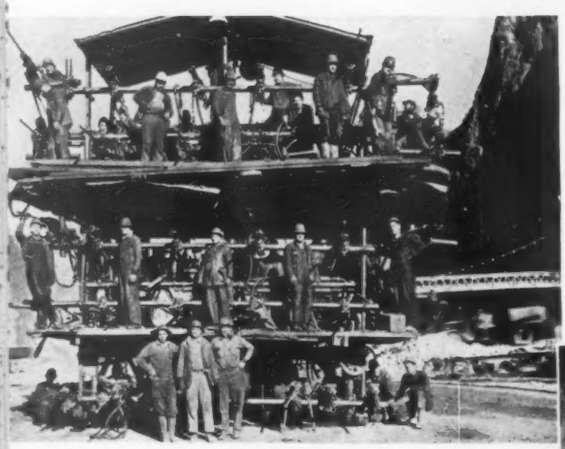
Scaling. Hundreds of feet above the river, scalers and drillers stripped the walls of loose soil and rock and drilled the powder holes necessary for blasting abutment foundations. A hazardous job to remove future hazards from falling rock.

Blasting operations on a large scale were necessary to insure a solid foundation for the base and abutments of the dam in the hard, durable rock (andesite breccia) through which the Colorado has cut the canyon. Bed rock was located between 110 and 130 ft. below low water level.

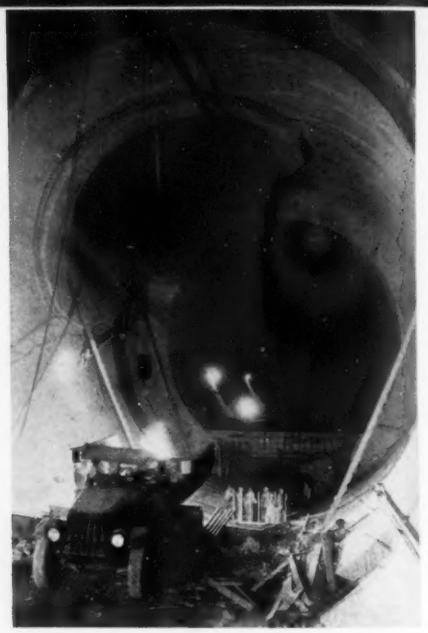
Aggregate Plant— the desert provided an ample supply of sand and rock for concrete mixing operations. This huge gravel plant, having a capacity of 700 tons per hr., was located in a dry sink one mile upstream from the damsite. Today, this area is far below the surface of Lake Mead formed by the dam.

TUNNELS

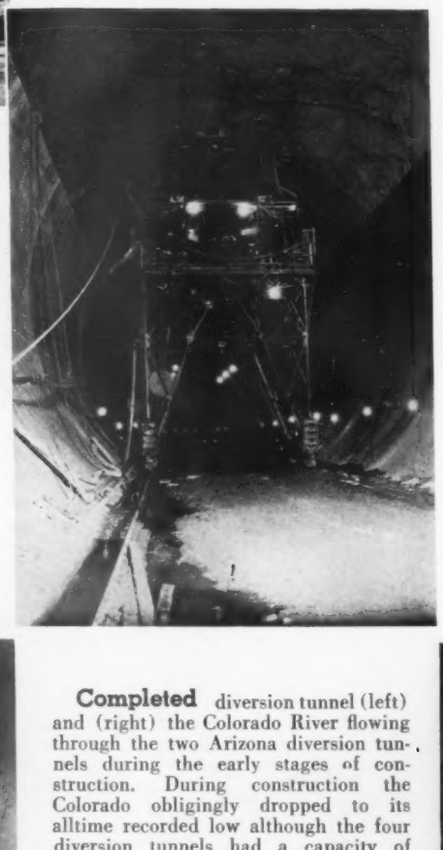




Lining the diversion tunnels with a 3-ft. surface of concrete was expedited by moveable forms such as the one shown here for pouring the tunnel walls. The arch or top section lining was accomplished by forcing the concrete into the forms under air pressure.

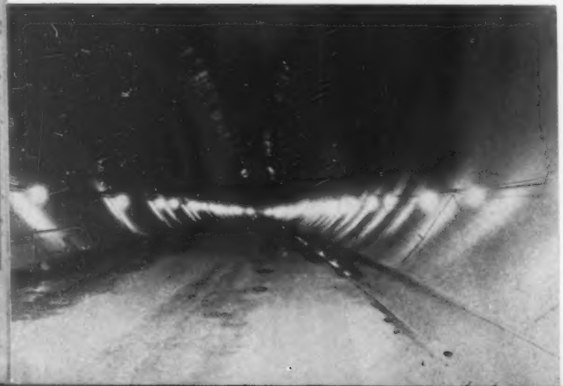


Boring Powder Holes to blast down the face of the 56-ft. tunnels in solid rock required special tools to speed progress. Here is a drilling jumbo, as its name implies, a huge machine which moved to the face of the tunnel and drilled more than a score of 10-ft. powder holes in the face by means of gang of automatic, pneumatic drills. Holes were charged, detonated and the material blown down from the face removed by dump trucks —a cycle repeated many times in driving the three miles of diversion tunnels.

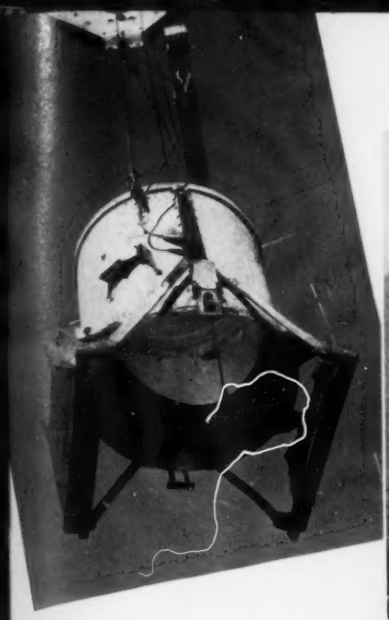


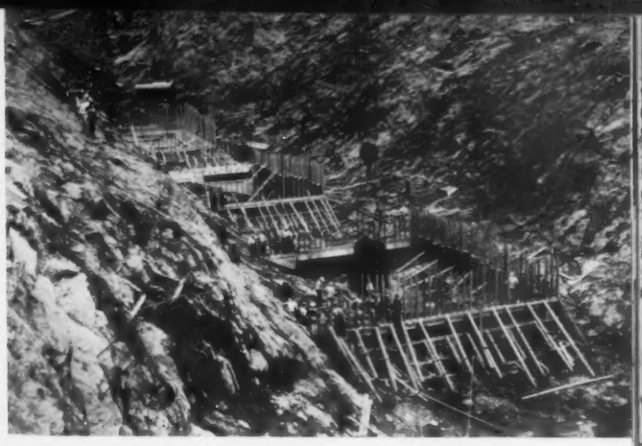
Working on the arch section of a 56-ft. tunnel is easy with this jumbo shown at the right which was used for a variety of purposes such as "trimming" the rock ceiling, setting forms, etc. Manpower was multiplied many times by such machines.

Junction of the tunnel (entering at upper left) joining the upstream intake tower with the inner diversion tunnel. When work had progressed to the point where the tunnel was no longer needed for diversion, permanent concrete plug was placed upstream just beyond this point and a 30-ft. diameter steel penstock installed joining the intake tower with the four branch penstocks leading to generating units and continuing to the downstream release valve chamber near the lower end of the diversion tunnel.



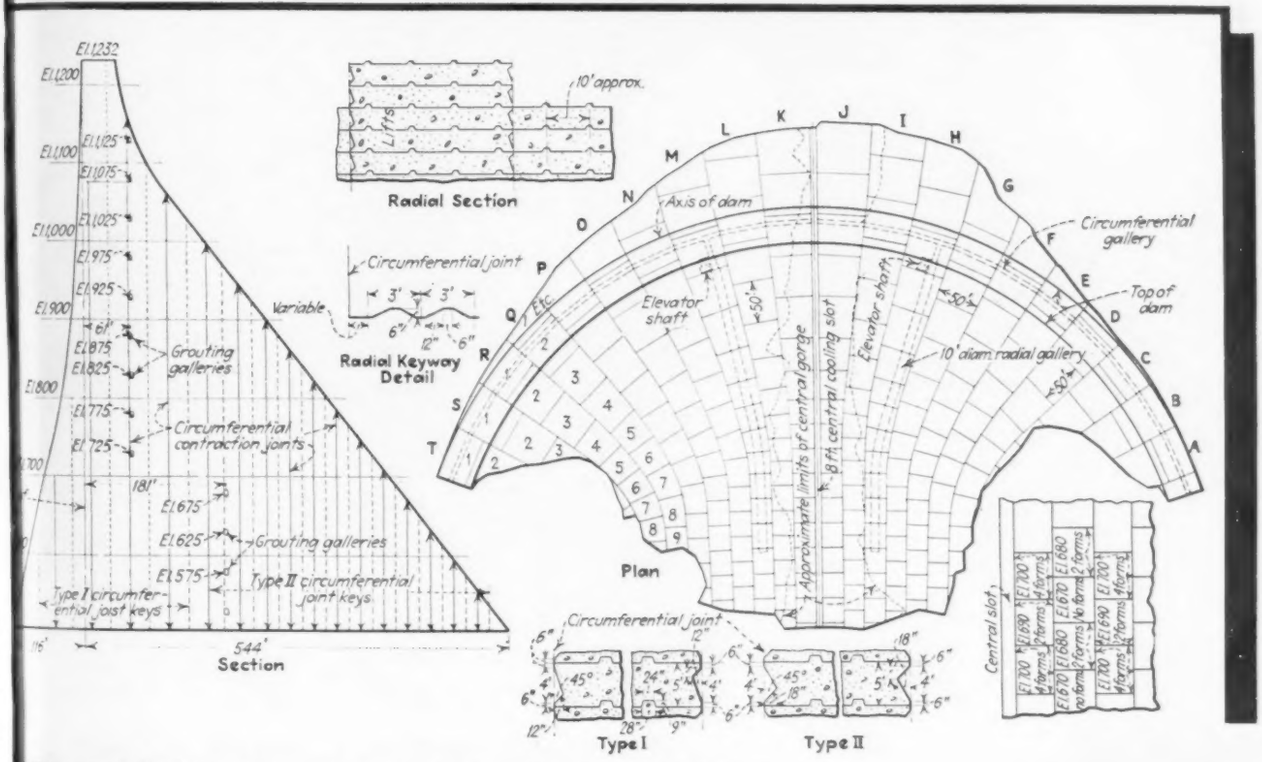
Completed diversion tunnel (left) and (right) the Colorado River flowing through the two Arizona diversion tunnels during the early stages of construction. During construction the Colorado obligingly dropped to its alltime recorded low although the four diversion tunnels had a capacity of 800,000 sec. ft.





Bottom Dump Bucket (left) of 8 cu. yd. capacity solved the problem of uniformity in concrete placing by spreading the wet concrete over large areas on a "live" surface. (Center) Buckets were transported by cableways which picked them up at the canyon rim from special flatcars and carried them to the forms, and back again to the flatcar.

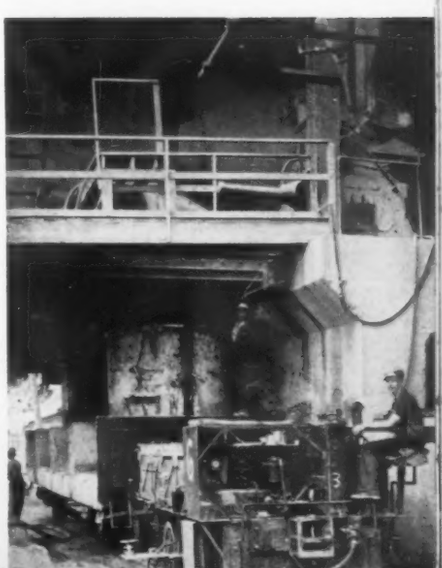
First Bucket of concrete (above) being poured in Boulder Dam. From this point activities accelerated until the peak placement of 10,462 cu. yd. of concrete daily was reached.

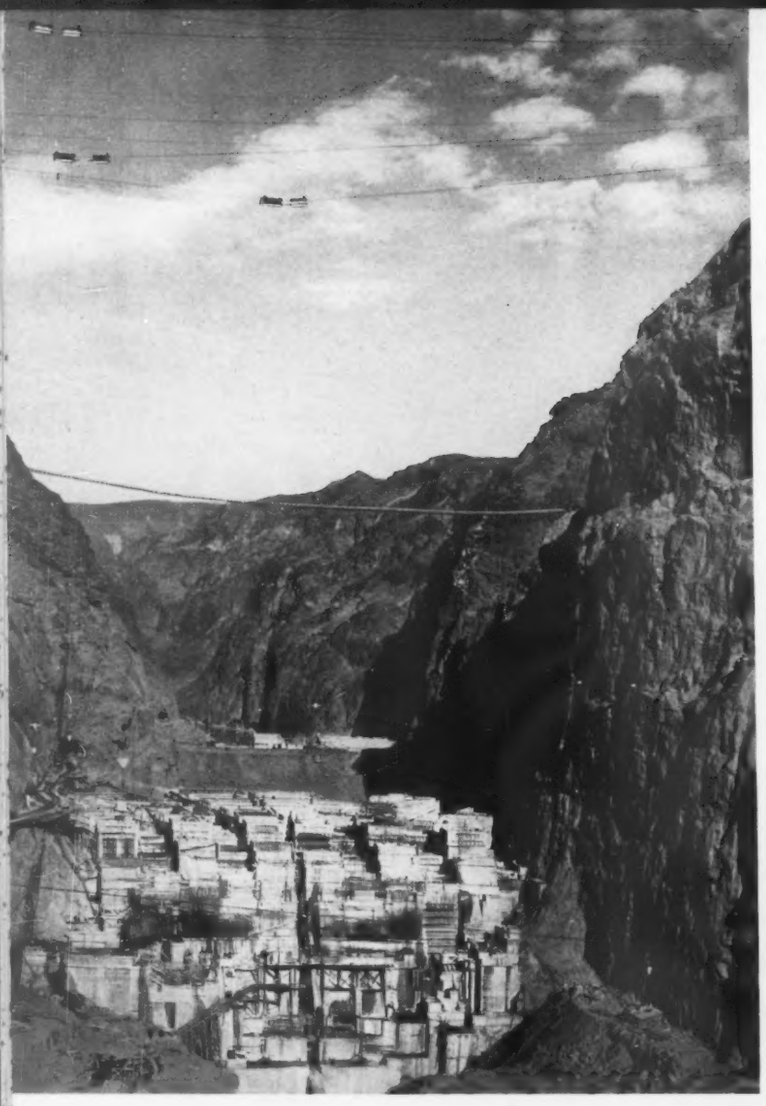


Plan and Section of Boulder Dam showing how the 3,400,000 yd. mass of concrete was built up in a series of columnar blocks. Note the variations in size of the columns between upstream and downstream faces of the dam. Columns were keyed together circumferentially and radially.

The dam is of the concrete, arch gravity type, weighs nearly 6,600,000 tons. Height 727 ft., thickness at base, 660 ft.; crest 45 ft.; length along crest, 1180 ft. Maximum water pressure at base, 45,000 lb. per sq. ft.

Concrete Transportation was accomplished by five cableways spanning the canyon. Four of these had moveable self-propelling towers on each side of the canyon, the towers running on tracks parallel to the canyon edge to afford complete coverage of the damsite pouring operations. The fifth had a fixed headtower on the Nevada side and a moveable tail tower on the Arizona side moving on a radial track to give coverage of the power house concrete placement. (right) Concrete buckets, hauled on flatcars by storage battery locomotives, were moved to positions along the canyon walls and rim and swung down into the forms in the canyon by the cableways.





Progress was measured in 5-ft. stages. This view of the downstream face illustrates the construction method used which consists of interlocking vertical columns varying in size from 25 by 30 ft. to 55 by 60 ft. near the upstream face. Alternate rows of columns are maintained at different heights horizontally and longitudinally, the upstream row columns always being higher than adjacent downstream columns. A maximum variation of 35 ft. in surface level and a maximum increase in height of 5 ft. in 72 hr. was permitted as a means of controlling the uniformity of concrete and simplifying form construction. By using this method of construction only the highest columns in the highest rows require forms on all four sides, the surface of these higher columns providing two or more surfaces against which lower blocks are raised. As the elevation increased abutment blocks gradually assumed columnar forms and were included in the "step" program.

Although the time required to pour a 5-ft. "lift" for a 25 x 30 ft. column was approximately 1½ hours, the time restrictions did not slow the job down because of the large area covered by the dam which enabled pouring operations to be shifted to other columns. A field check was made every morning to check heights of all columns and correct those which were out of line.

When the height of the dam had reached elevation 920 ft., operations of the low-mix plant and the railway trestles along the canyon wall over which trains of concrete buckets were hauled to the cableways had to be abandoned because of the formation of the reservoir. All operations then were carried on from the hi-mix plant.

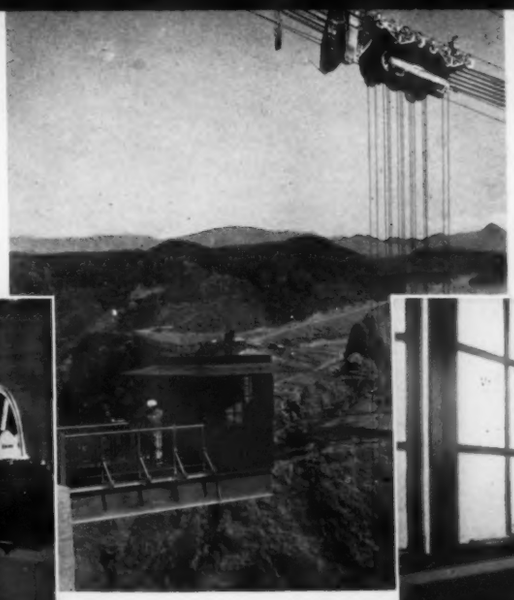
This photograph is unusual in that all of the carriages of the five moveable cableways described on the preceding page are shown over the damsite.

CONSTRUCTION

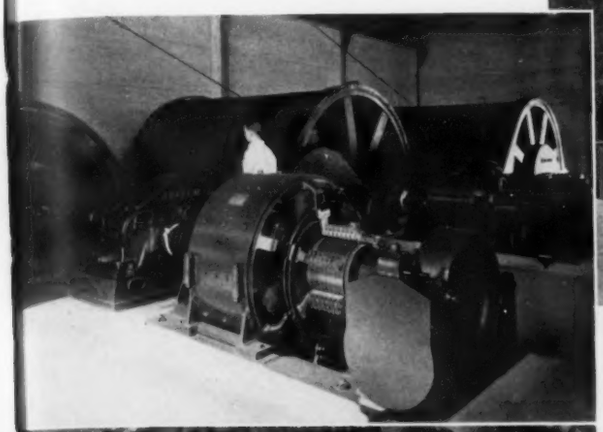
Intake Towers (lower right) rise with the dam. The base of these towers, each of which will contain two cylindrical gates, is at elevation 894, 369 ft. above the base of the dam.

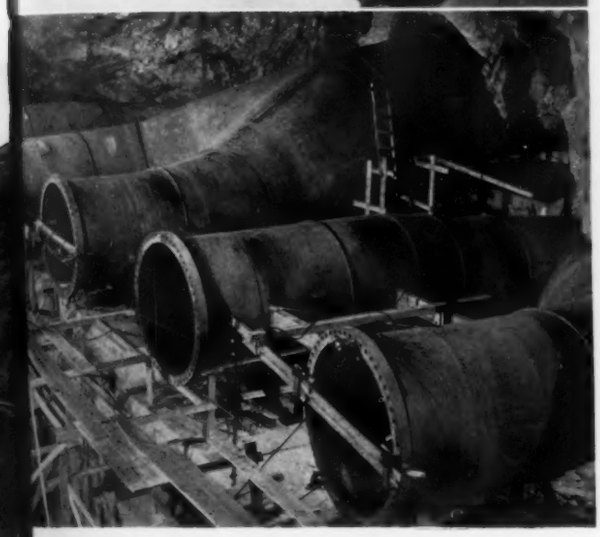
Hi-Mix Blending Plant (lower left) and headtower of the 150-ton permanent cable-way built by the Government. The blending plant not only mixed concrete but also delivered dry cement to the low-mix concrete plant a distance of more than a mile by a compressed air delivery system.

150-Ton Hoist House (below) for the permanent cableway built to transport penstock sections and power house equipment from the rim into the works in the canyon. The carriage consists of 48 wheels riding on six 3½ in. cables and sheaves sufficient to provide a 16-part tackle for 150-ton loads.



Cableway Control House (left) extends out over the canyon rim so that operator (below) can observe movement of the hoist. The hoist serves four loading platforms at points within the canyon and the control may be transferred to any loading platform through interlocking changeover switches if desired.





A Cooling System to dissipate heat generated in the "setting" of the concrete was necessary to bring the mass of concrete in the dam to a uniform temperature so that grouting could be expedited and future cracking eliminated. 300 miles of 2-in. steel tubing (right) to carry the refrigerant was imbedded in the dam spaced at 10-ft. vertical intervals and 11 ft. horizontal intervals. Two separate cooling systems were used. Immediately after the "pour" river water, reduced to 70 deg. F. by being passed over the huge cooling tower (lower left) was circulated through the pipes which were connected to 14-in. headers running longitudinally through the 8-ft. slot in the center of the dam (lower right). When the next "lift" was made, the river water was diverted to the header serving that level and refrigerated water at 44 deg. F. from the 1,000 ton refrigerating plant (center below) was circulated through the first system to bring the concrete down to final temperature of approximately 70 deg.

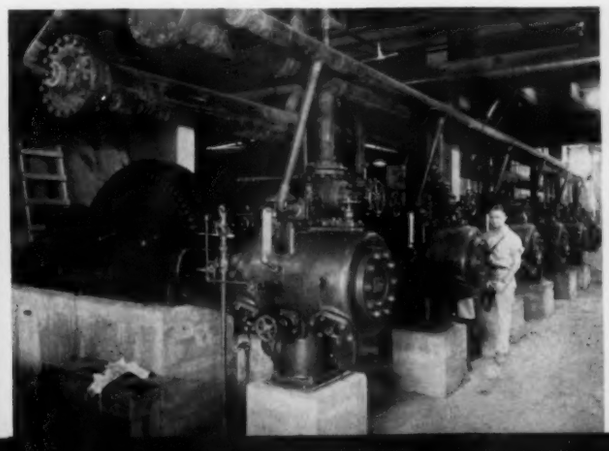
It was estimated that it required the removal of 38,600 B.t.u. for each of the 3,350,000 cu. yd. of concrete in the dam to accomplish this.

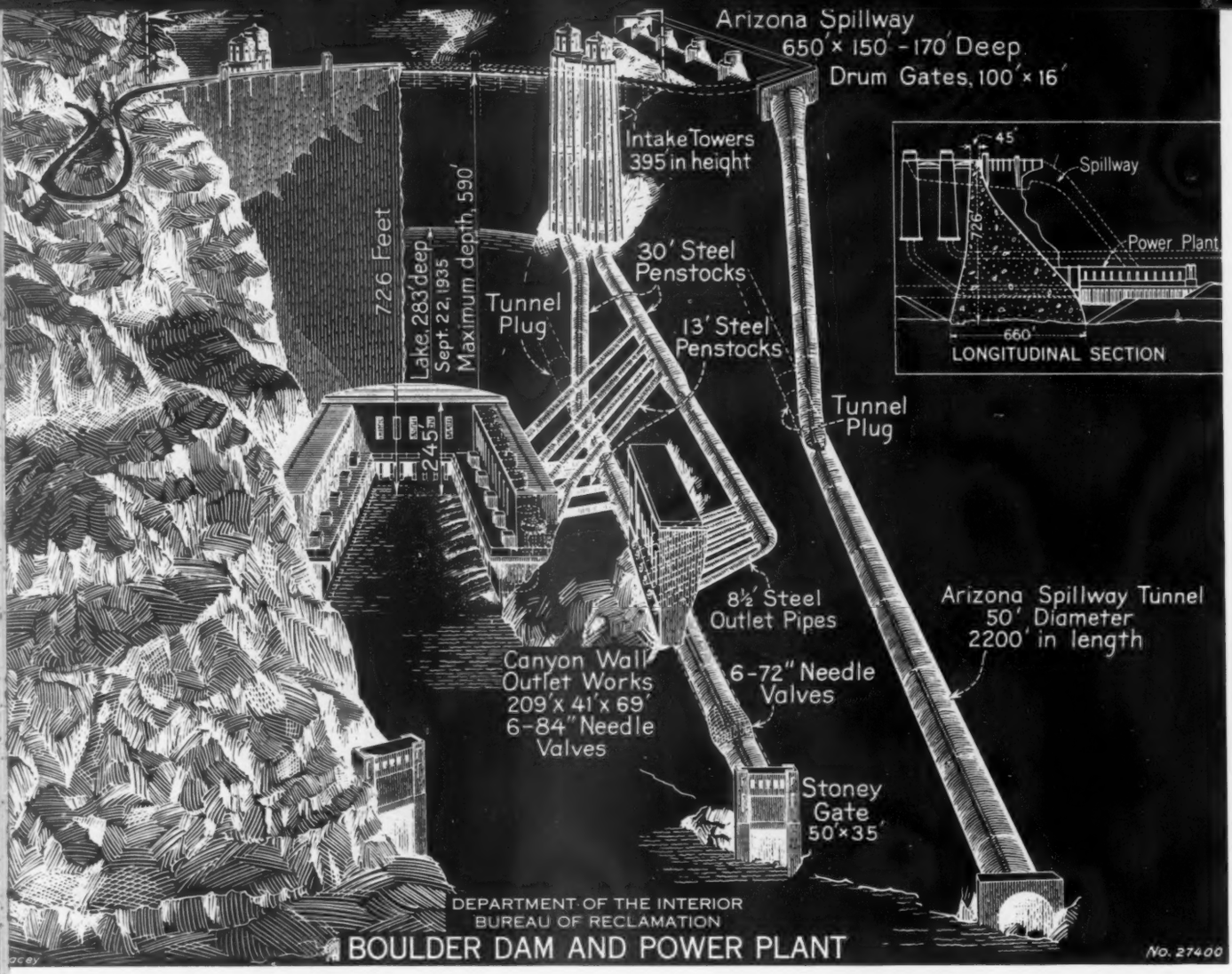
Canyon Wall Outlet Valves—this view shows the downstream terminal of the upper penstock during construction. Each of these branches will be connected to 84-in. needle valves to be used for emergency discharge around the dam. There are two such outlet works, one on either side of the canyon 180 ft. above the river level. Lower penstocks discharge through 72-in. needle valves located in a chamber in the downstream diversion tunnel.

Piping for the cooling system supply to the dam consisted of four 14-in. headers carried in an 8-ft. slot through the center of the dam. These headers fed supplementary 6-in. headers of both cooling circuits.

Cooling Tower built of redwood on the lower coffer dam is 160-ft. long, 16-ft. wide and 45-ft. high, and proved effective due to the low humidity and natural draft in the canyon. 6,000 g.p.m. were cooled to temperatures as low as 65 deg. F.

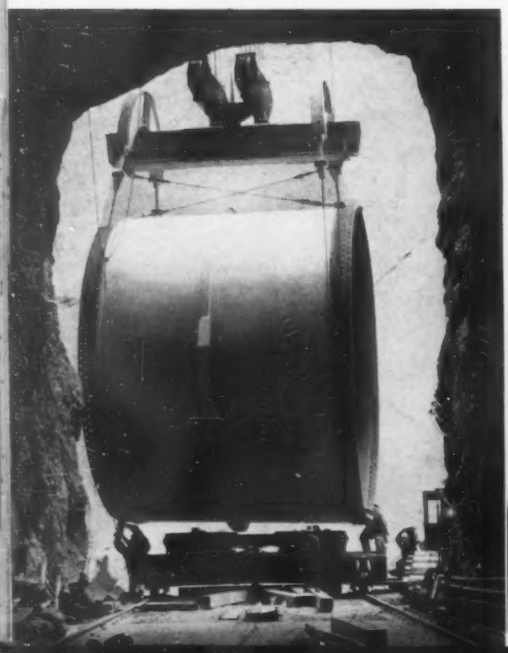
Refrigerating Plant utilizes three 275-ton compressors which were remodeled from air compressors used in driving diversion tunnels by substituting ammonia cylinders for air cylinders. Refrigerated water at 44 deg. F. entering the cooling system of the dam returned to the plant at 74 deg.





Cutaway View showing the Arizona penstock layout which is duplicated in all essentials on the Nevada side. In the four diversion tunnels, two of which are shown in perspective, are installed 30-ft. steel penstocks, the outer tunnels being connected with the spillways and the inner tunnels with the upstream intake towers. Another pair of 30-ft. penstocks, installed in the upper 37½-ft. tunnel join the downstream intake towers with the canyon wall outlet valve houses. From the lower inner penstock and the upper penstock four 13-ft. branch penstocks of each serve the powerhouse turbines. At the downstream end, the upper penstock terminates in six 8½-ft. penstocks connecting with the needle valves in the outlet house.

Penstocks are constructed from steel plate varying in thickness from .625 in. to 2¾ in. As the 30-ft. diameter sections for the upper end of the penstock weigh as much as 150 tons and because of their size, the sections had to be fabricated on the site in a special plant built by the Babcock & Wilcox Co. Steel was shipped from eastern plants in flat plates, the largest of which weighed 23 tons. Two such plates constituted a flatcar load. Three of these plates, 32-ft. long, 12-ft. wide and 2¾-in. thick were fabricated into a 12-ft. section of 30-ft. diameter penstock. Plates were marked for pattern, placed in a special cutting machine which also cut a beveled edge necessary for welding, welded, inspected by a special X-ray machine and then heated to relieve stresses. Required for the installation were 4,700 ft. of 30-ft. diameter penstock; 1,900 ft. of 25-ft. diameter; 5,600 ft. of 13-ft. diameter and 2,300 ft. of 8½-ft. diameter penstocks all of which was fabricated at the Boulder plant of B. & W.



Finished Penstock section, giving some conception of its size by comparison with the man standing at the left.

Rolling Plates to shape in the most powerful machine ever designed for this purpose. The rolls can impose a load of 3,500,000 lbs. on the plate and can handle plate up to 2¾ in. in thickness. Where special conical sections were required, the plates were rolled after being bulldozed into required shape by two 1,500-ton presses working together as a unit.

When the section has been shaped and the edges brought together, it is spotwelded and placed in the automatic welding machines which consist of automatic welding heads mounted on gantry units to provide flexibility. Welding rod, fed through the head automatically, comes in 12-ft. lengths with threaded ends so that new sections could be added without interrupting the continuity of the process. Approximately 700,000 linear feet of welding were required to fabricate 45,000 tons of penstock used on the project.

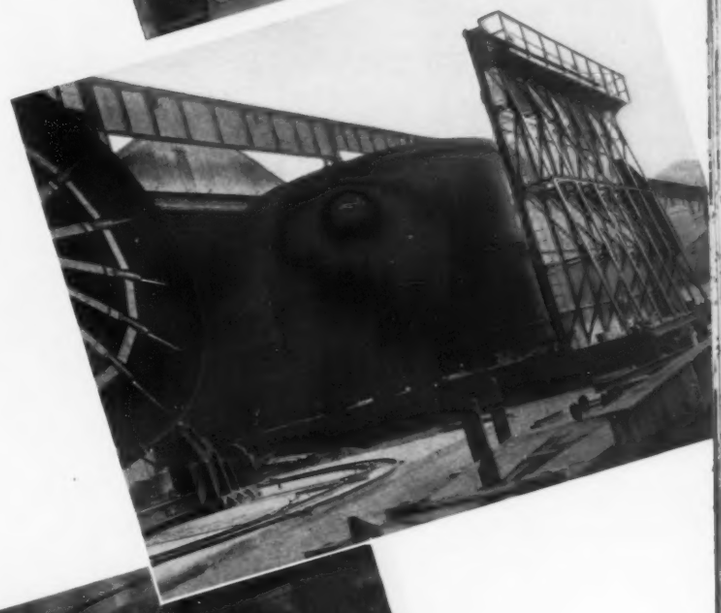
Stress Relieving after the forming and welding was accomplished in this huge oil-fired oven. The largest of its kind, the oven is 36 ft. long, 41 ft. wide and 28¼ ft. high. The front wall moves out on rails, the wall being integral with the car which carries the penstock sections into the oven. Sections are subjected to contact with hot gases circulated through the oven on a pre-determined reversed cycle in which the hot gases enter first on one side of the oven and then on the other to equalize the temperature on all sides of the section. Automatic control maintains a 1,200 deg. F. temperature for a period of time depending upon the thickness of the plate after which the temperature is reduced for a 3-hr. "soaking" period at 600 deg. F.

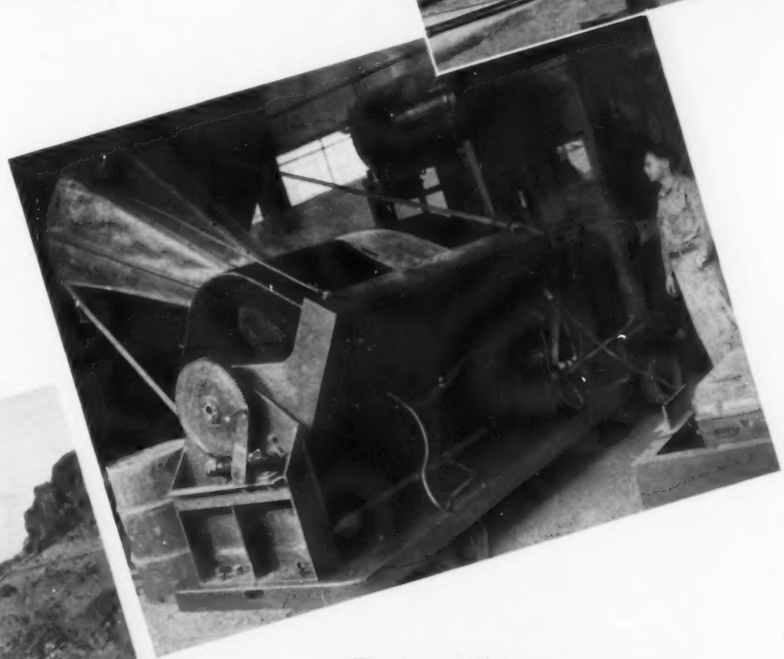
Capacity of the oven is sixteen sections of 8½-ft. penstock; four 13-ft. sections and but one 30-ft. section as shown in the illustration at the right.

Inspection by X-Ray was required by the U. S. Bureau of Reclamation of all welds to insure homogeneous structure. This is one of the two portable 300,000-volt X-ray machines which photographed via X-rays all of the welds made in fabricating the penstocks. Machines either moved along a longitudinal weld or remained stationary while circumferential welds were rotated before its aperture. Films were developed and checked as rapidly as possible to insure approval before the section continued through the process. Where flaws were indicated, the metal was chipped away by hand and the spot re-welded manually. Sections were tested after stress-relieving, one weld specimen being taken and tested as a joint and for the strength of the weld metal itself both of which had to be as strong as the plate itself.

Installation in the tunnels was done with special dollies to move the section into position (preceding page, left). There an internal template checked shape and alignment while the section was being riveted to the adjoining section. Sections are anchored into position by means of special supports built into the rock of the diversion tunnel.

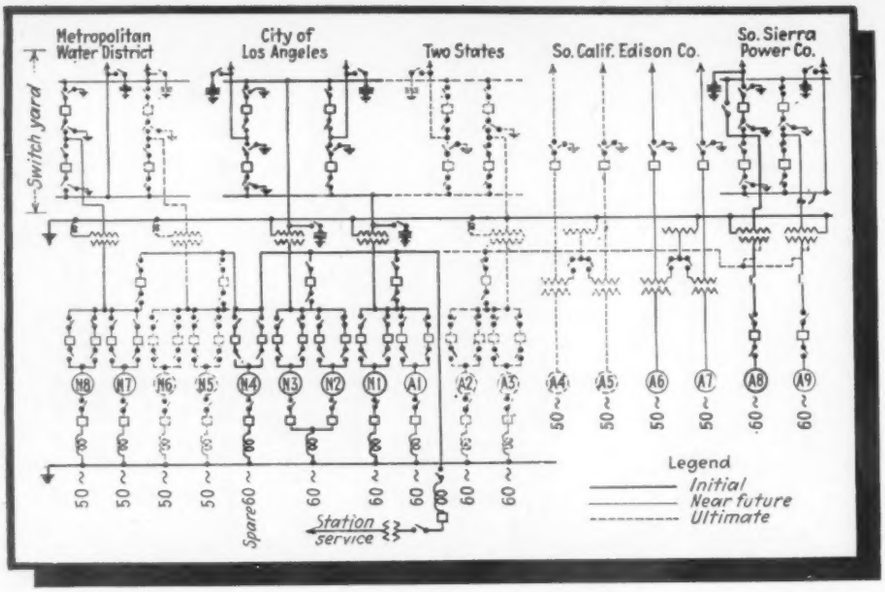
Stiffener Bars are installed for added strength at points where branch penstocks take off from the main penstock. A view in the upper penstock shows branch penstock construction as well as erection equipment further downstream (preceding page, center).





Transportation from the storage yard of the welding plant to the canyon rim was accomplished by special 16-wheeled trucks towed by tractors. The penstock sections rested in a special cradle. Equipment occupied the entire road which had to be made without the usual crown to expedite movement of these 150-ton loads.

PENSTOCKS


Metropolitan Water District
City of Los Angeles
Two States
So. Calif. Edison Co.
So. Sierra Power Co.
Switch yard
N8 N7 N6 N5 N4 N3 N2 N1 A1 A2 A3 A4 A5 A6 A7 A8 A9
50~ 50~ 50~ 50~ Spare 60~ 60~ 60~ 60~ 60~ 60~ 50~ 50~ 50~ 50~ 60~ 60~
Station service
Legend
Initial
Near future
Ultimate

One-Line Diagram of the main circuits of Boulder Power house and switchyard. Generating units comprise:

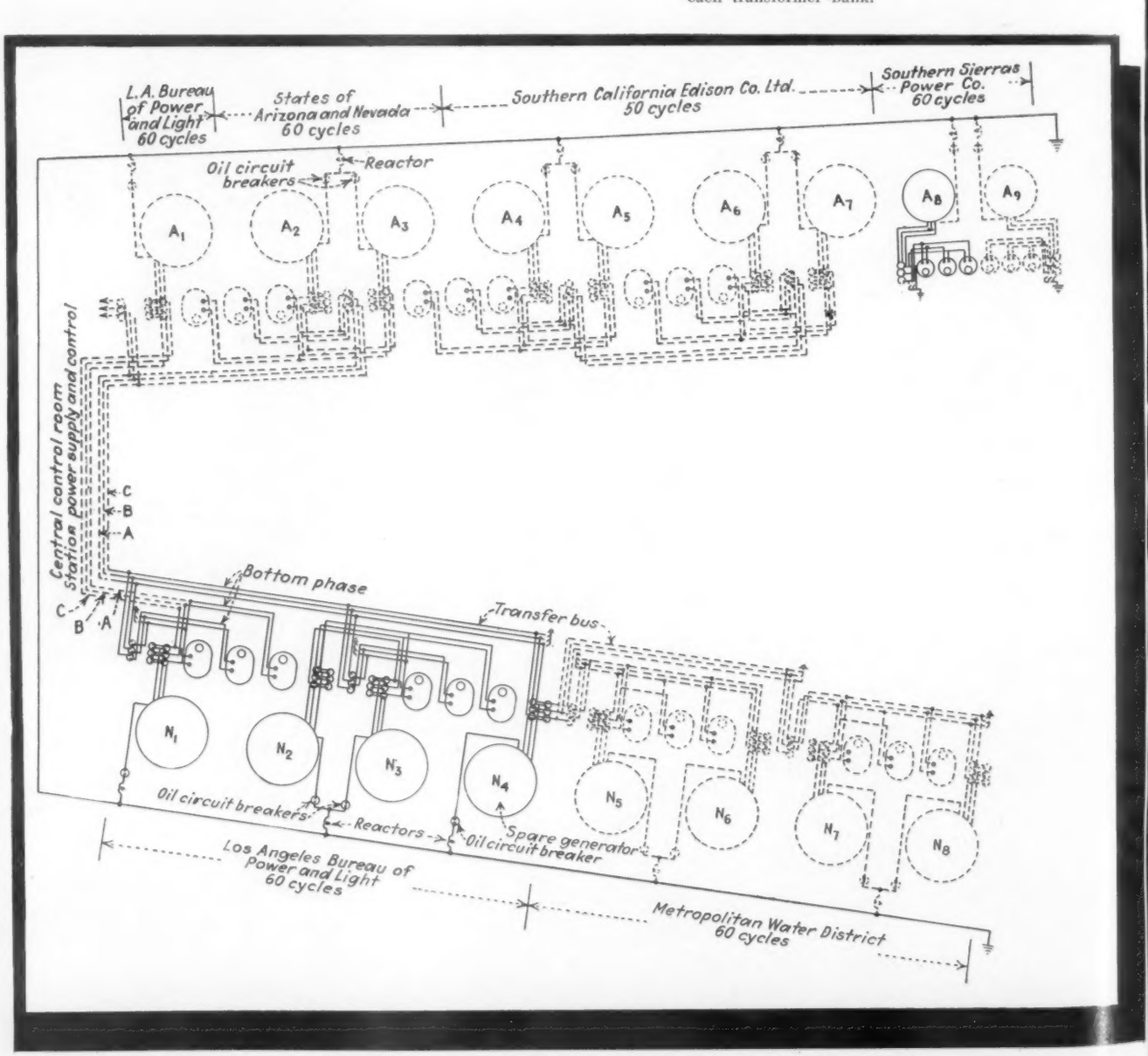
15—82,500 kva., 16.5 kv. units
2—40,000 kva., 13.8 kv. units
2— 3,000 kva., 2.4 kv. house units

Bus arrangement is complicated by the fact that four of the main units will operate at 50 cycles and the remainder at 60 cycles. The original installation comprises four 82,500 kva. units and one 40,000 kva. unit as well as the two station service units. It will be noted that a double bus arrangement is provided both in the power house and in the switch yard.

Generator Room Layout and bus connections. In the Nevada wing there will be installed eight 82,500 kva. units, four of which are allocated to the Los Angeles Bureau of Power & Light and four to the Metropolitan Water District. In the Arizona side, one 82,500 kva. unit is allocated to the L. A. Bureau of Power and Light, one each to the states of Arizona and Nevada, four to the Southern California Edison Co., Ltd. and the two 40,000 kva. units to the Southern Sierras Power Co. With the exception of the latter two, all 60 cycle units will be connected by means of a transfer bus which extends along the Nevada wing, across the central portion of the power house (where all control and station service units are located) and in front of the three upstream units on the Arizona side.

Two main generating units, through independent bus connections and metal clad switchgear units, supply one bank of 3 single-phase 16.5/ 287.5 kv. transformers, independent transmission circuits being carried up the canyon wall to the switchyard from each transformer bank.

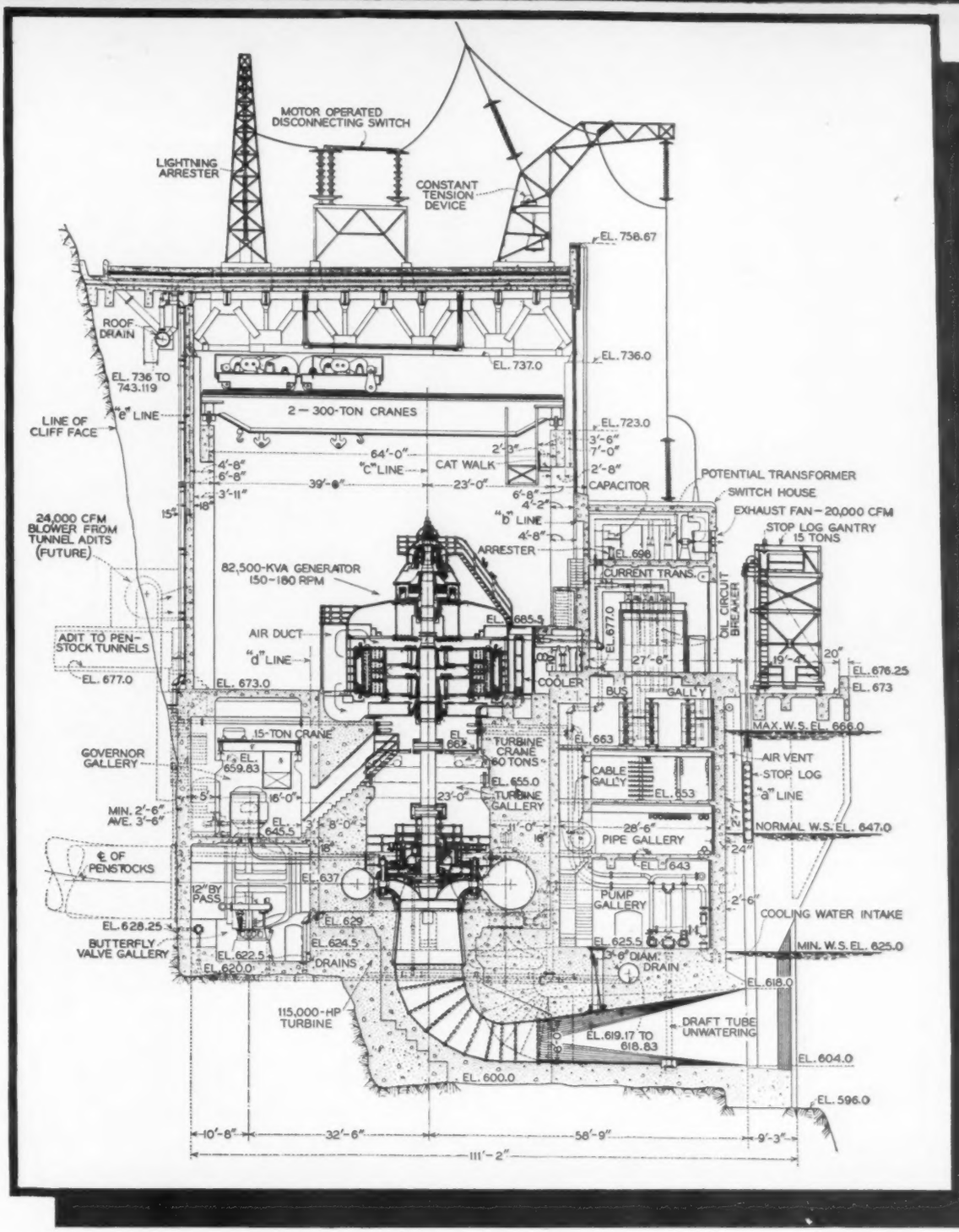
POWER HOUSE

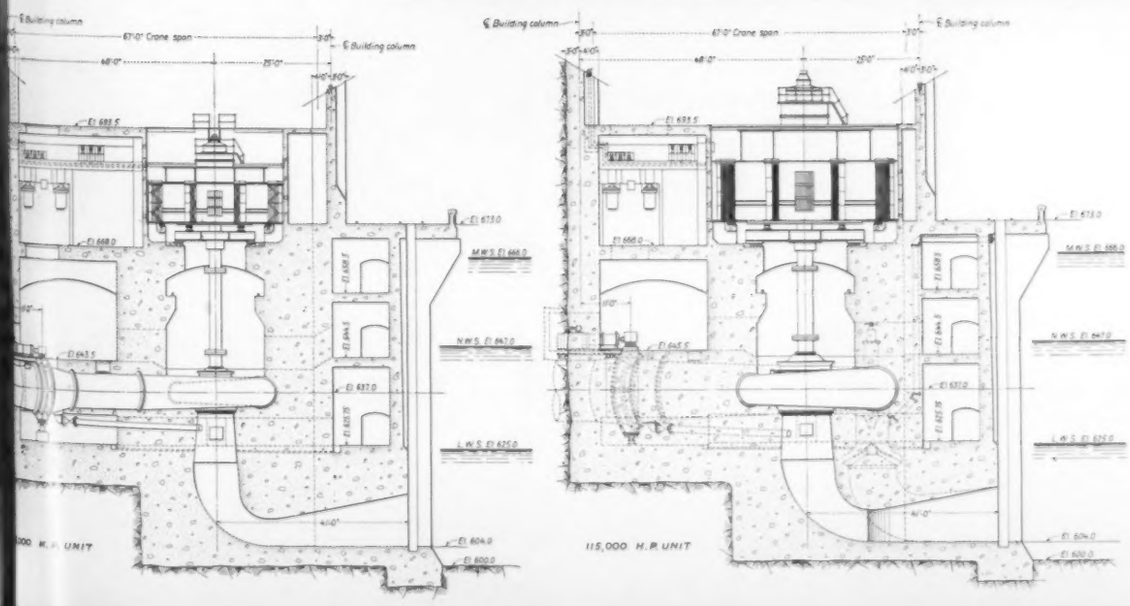

L.A. Bureau of Power and Light 60 cycles
States of Arizona and Nevada 60 cycles
Southern California Edison Co. Ltd. 50 cycles
Southern Sierras Power Co. 60 cycles
Oil circuit breakers
Reactor
A1 A2 A3 A4 A5 A6 A7 A8 A9
Central control room
Station power supply and control
C
B
A
Bottom phase
Transfer bus
N1 N2 N3 N4 N5 N6 N7 N8
Oil circuit breakers
Reactors
Spare generator
Oil circuit breaker
Los Angeles Bureau of Power and Light 60 cycles
Metropolitan Water District 60 cycles

Cross Section of the power house through center line of one main generating unit. The logical layout and complete accessibility of all component parts is worthy of attention. On the canyon side of the power house are two galleries running the entire length of the wing. In the lower gallery are housed the 168-in. butterfly valves installed in the branch penstocks serving the main turbines. In the upper gallery, all the control for the hydraulic apparatus, the unit auxiliary control boards and all other control units with the exception of the generator control cubicles for electrical connections, are installed.

On the outboard or river side of each wing, other services are segregated into four galleries. The lower gallery contains sump pumps for the turbine pits. Above this is the pipe gallery where all air, water, and oil piping is grouped. Above the pipe gallery, is the cable gallery where control cables are carried in easily accessible trays and at the top the 23 kv. bus gallery to be described hereafter.

Outside of the power house proper and installed on a platform along the wing on the river side are the five switchhouses between which are the transformer bays. 287.5 kv. circuits are carried vertically to the take-off structure on the roof which consists of a tension device to prevent slack in the conductors being carried up the canyon wall and the lightning protection provided for outgoing circuits.

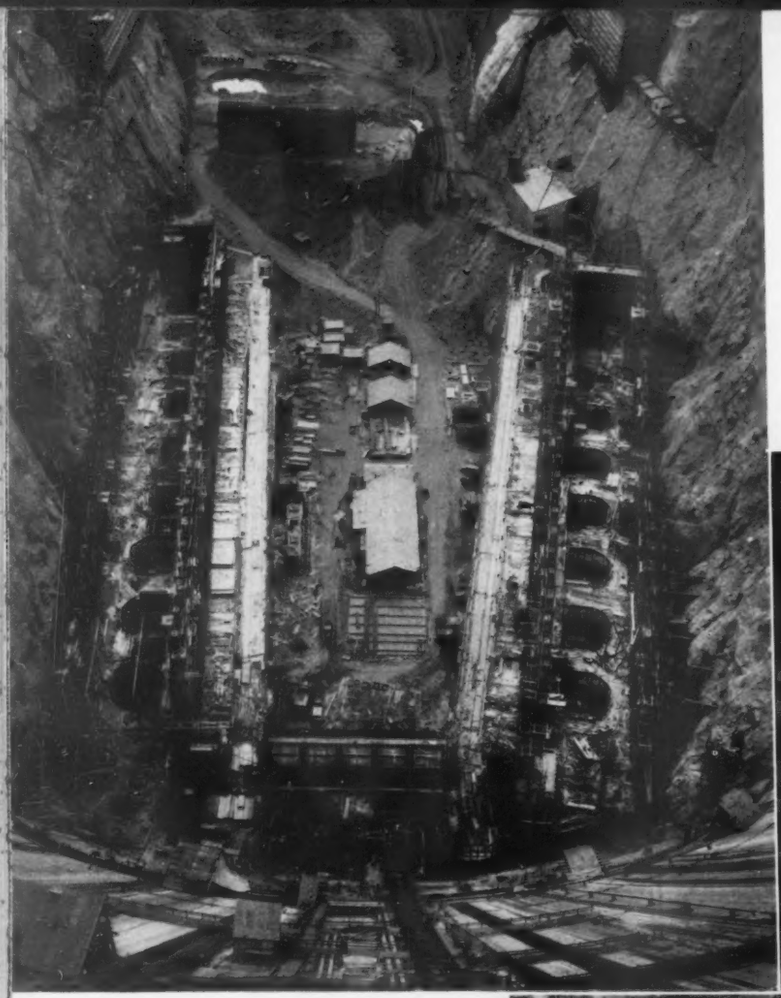




Cross Section of the 40,000 kva. unit (left) and the 82,500 kva. unit (right). The latter are the largest yet built and operate at a speed of 180 r.p.m. Each main turbine has a hydraulically operated, butterfly-type, vertically rotating shut-off valve at the inlet to the turbine casing. These valves will close against a pressure of 300 lbs. per sq. in. with an 8,000 sec. ft. flow. Two emergency by-passes are provided for each turbine.

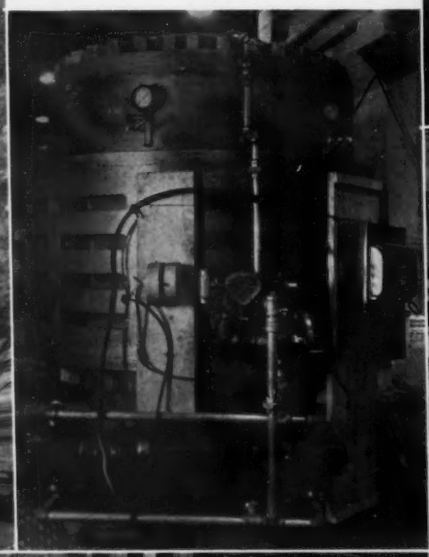
Butterfly valves normally operate with the pressure equalized on each side of the vane, the rotor being actuated by oil pressure from an individual oil pump supplying oil at 1,800 lb. per sq. in.

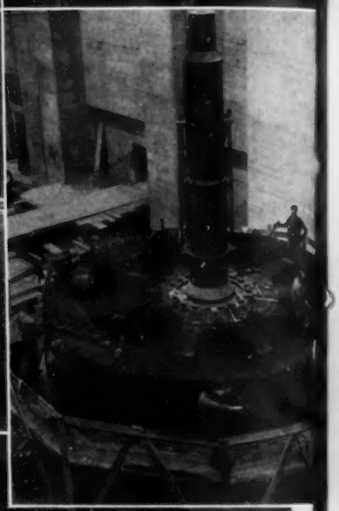
Each turbine is also provided with a pressure regulator capable of discharging 80 per cent of the full load water flow into an energy absorbing chamber.

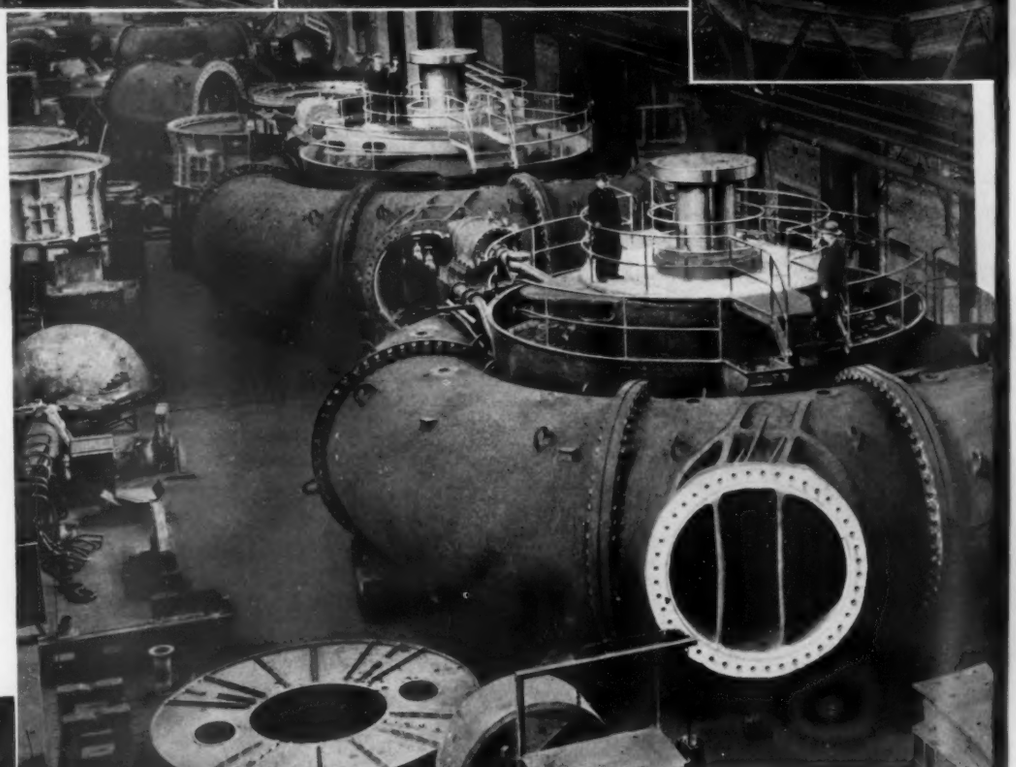


Power House during the early stages of construction. This view taken from the top of the dam clearly shows the turbine pits in which the units will be installed.

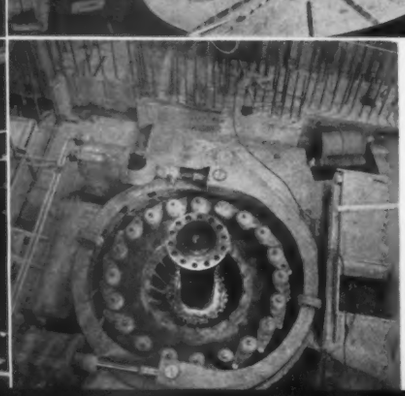
Butterfly valves, 168-in. in diameter, are installed between the ends of the branch penstock and the turbine intake. The hydraulic operator, shown below, employs a maximum oil pressure of 1,800 lb. per sq. in. and will close the valve against a 300 lb. per sq. in. pressure with an 8,000 sec. ft. flow. Lower right—stacking laminations on a generator rotor.





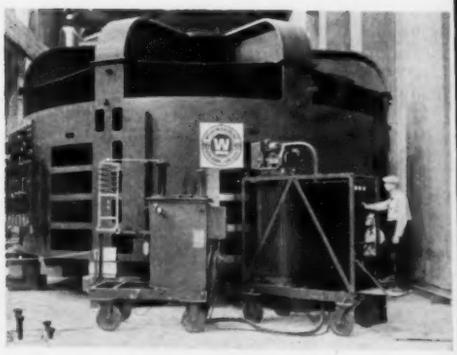


Stacking laminations in the stator of one of the 82,500-kva. main generators. The generators are 40-ft. in diameter, 32 ft. high and weigh 2,000,000 lb. Lower right—the 55,000-hp. turbine built by the Newport News Drydock and Shipbuilding Co. for driving the 40,000-kva., 257-r.p.m. Allis-Chalmers generating unit located in the downstream end of the Arizona wing. The hydraulic control of the turbine wicket gates is shown on the left.



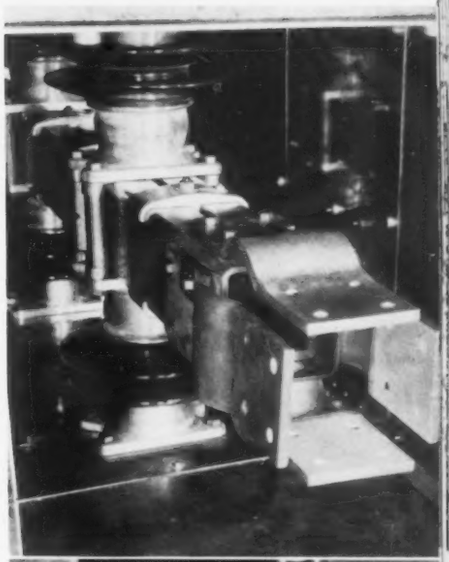
115,000-hp. Turbines set up in the Allis-Chalmers factory prior to shipment. There are four of these units installed initially. Turbines are of the single-runner vertical-shaft type with cast steel scroll cases and a single-piece cast steel runner. They will operate at 180 r.p.m. under a head varying from 360 to 590-ft., the normal head being 492 ft. Unique is the design which permits the turbine to be disassembled without disturbing the generator above.

Installing the rotor of a 82,500-kva. generator. The rotor weighs 500 tons and is handled by the two 250-ton cranes in the generating room. Stators for other units may be seen beyond this unit.

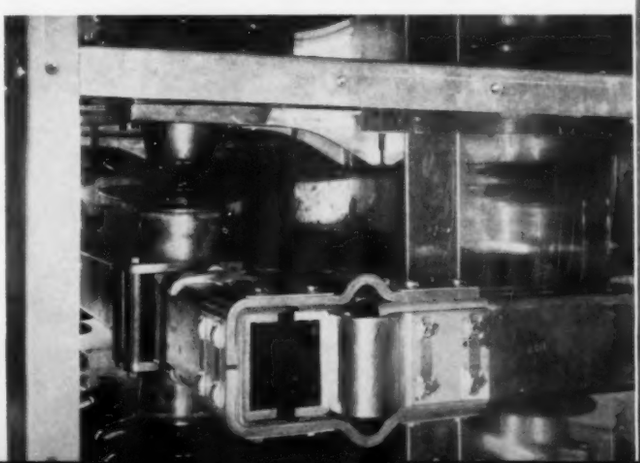


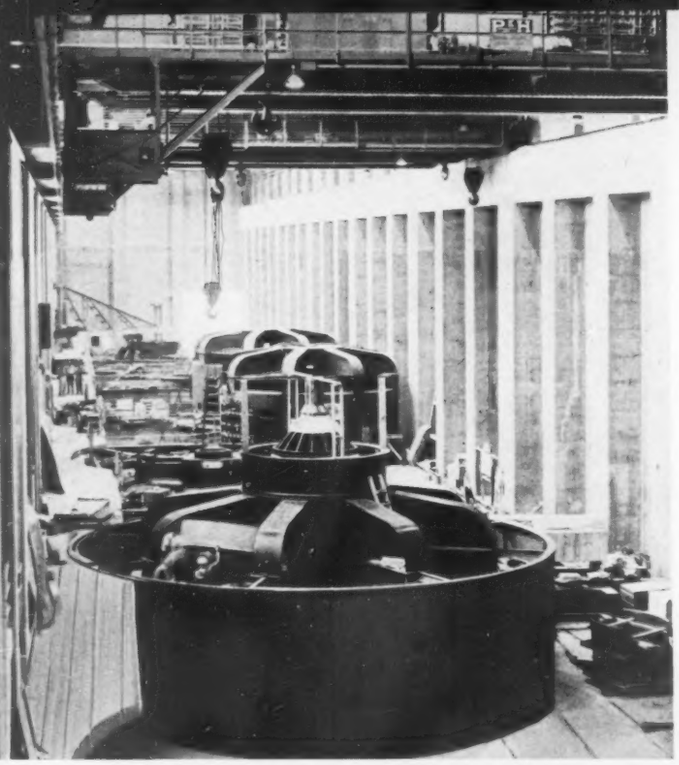
High Potential test is given a stator after assembly. The stators were shipped in segments in which laminations and coils had been installed.

Bus Gallery extends entirely around the power house. Here are installed the connections between the generators, transformers and the generator transfer bus. The bus consists of two "U"-shaped copper channels 6-in wide assembled to form a hollow square, having a copper cross-section of 2.92 in. and rated to carry 4,000 amp. at 23-kv. Channels are clamped rigidly on 18-in. centers and supported on single-piece, porcelain insulators with non-ferrous caps and pins at 6-ft. intervals. The entire bus structure is enclosed in a copper sheet enclosure to reduce eddy current losses. Complete phase isolation is a feature of the design. The bus assembly, including all fittings, was supplied by the I-T-E Circuit Breaker Co.



Details of the bus assembly. Contact surfaces of all splices, joints and connections are silver plated. Expansion joints, consisting of laminated copper, are provided at frequent intervals. Lower left—a right-angle connector; lower right—the multi-surface grounding switch; above—an expansion joint.



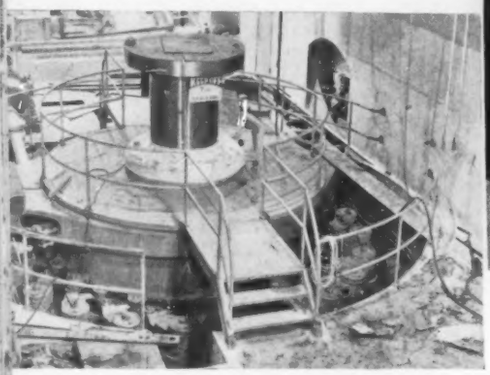


Main Generating Unit, rated 82,500 kva., 180 r.p.m., 16.5 kv., 60 cycles, and driven by a 115,000-hp. vertical reaction turbine. In the initial installation, four of these units and one 40,000-kva. unit will be installed. Two of the main units were manufactured by the Westinghouse Electric and Mfg. Co. and two by the General Electric Co. An additional two units are now on order. Except for their huge size, the generators are of conventional design in which a thrust bearing at the top of the unit carries the entire weight of the rotor and runner. Two guide bearings also are provided. Each unit has a direct connected main and pilot exciter (not installed when this view was taken).

An extra large moment of inertia of 110 million lb.-ft. squared is incorporated in the rotor to provide better stability for the long transmission system. Reactance also is low, the transient reactance being 21 per cent with a short circuit ratio of 2.4, these machines being equivalent to a normal rating of 125,000 kva.

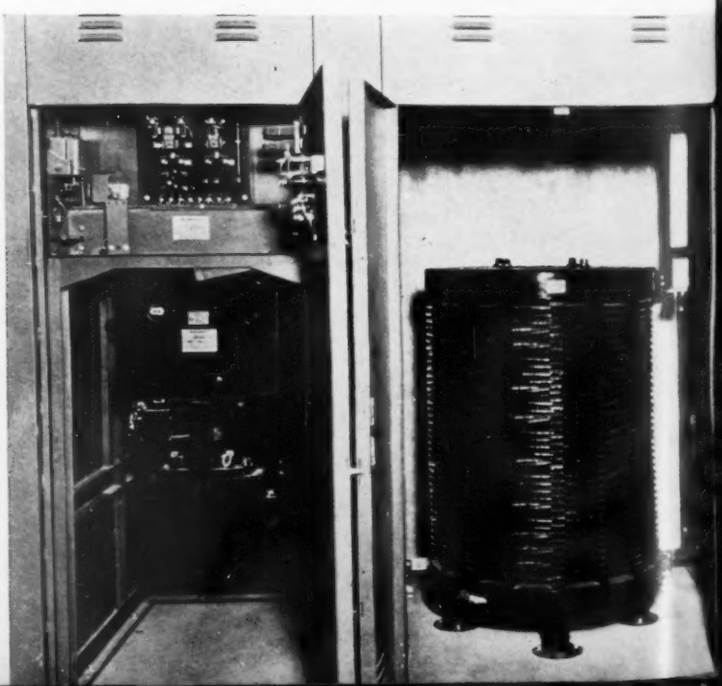
Air operated brakes are provided to bring the rotor to rest and are so arranged to act as jacks for raising the rotor up off the thrust bearing to facilitate inspection and maintenance.

115,000-hp. Turbine installed and ready for connection to the shaft extension of the generator. A crane in the turbine gallery permits disassembly from the side in the space shown here by removing shaft extension and without disturbing the generator assembly.

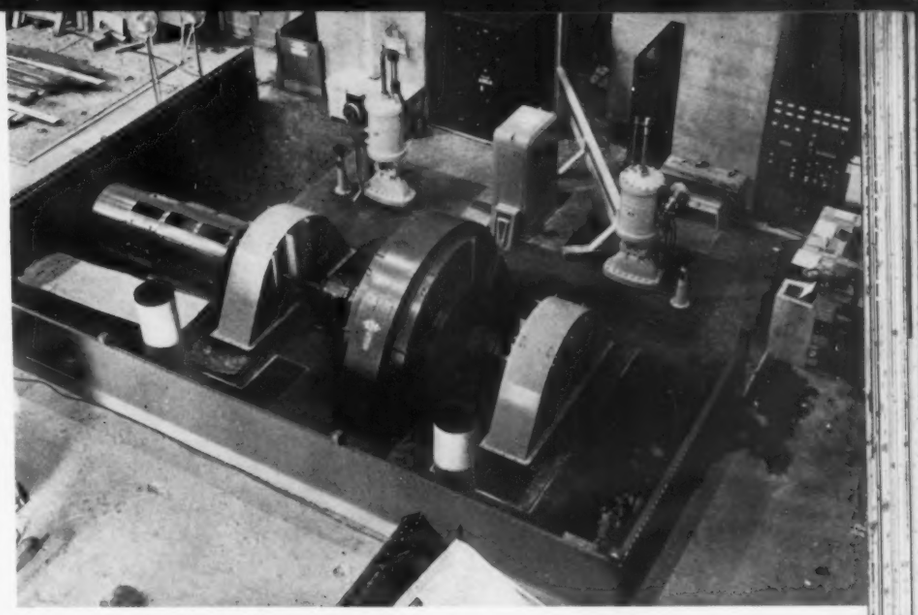


Neutral Reactors are connected in the neutral of each generating unit to limit ground fault current in the neutral to 10,000 amp. This shows the method of recessing the reactor and associated circuit breaker in the wall of the power on the cable gallery level.

Governor mechanism, built by the Woodward Governor Co., is capable of opening or closing the turbine gates in 5 seconds under full head. Governors are of the oil-pressure, relay valve actuator type controlling the gate position through oil-operated "servo" motors. Speed response of 0.01 per cent is obtained through a small permanent-magnet 7½-cycle generator mounted on top of the main unit driving a 7½-cycle synchronous motor, flyball mechanism. Pre-set load control, frequency control and automatic synchronizing are provided, the latter being obtained through an automatic thermionic device installed on the switchboard which controls turbine speed through the speed adjusting motor on the governor.

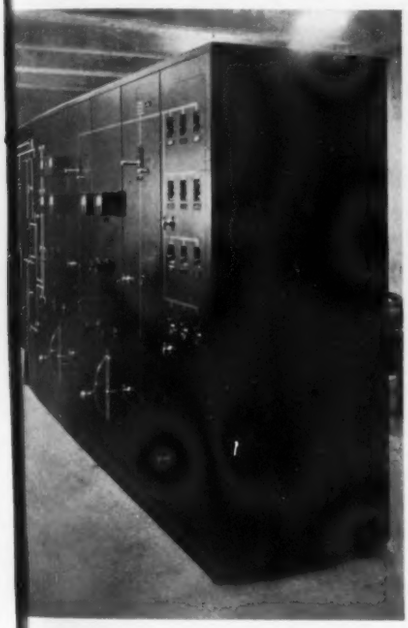


STATION POWER

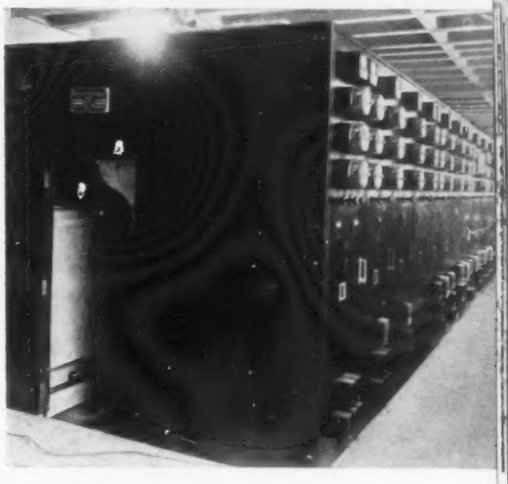


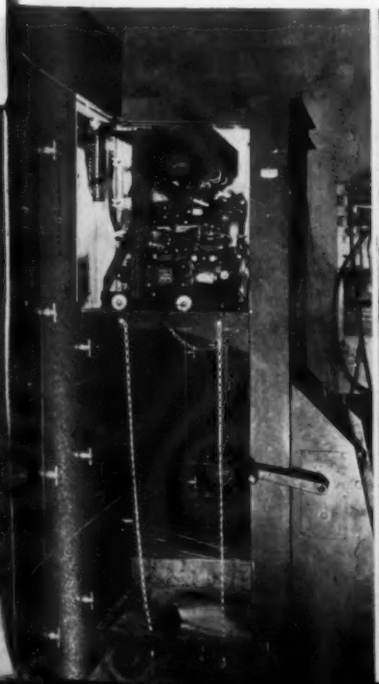
A House Generator rated 3,000 kva. and driven by a double Pelton impulse turbine, is installed at the upstream end of each wing of the power house. Governors and control cubicles are located against the inner wall of the main generating room on the operating floor. These units are connected by a 36-in. diameter penstock which is carried through the central portion of the powerhouse, the ends of the penstock being tapped into a branch penstock, serving the upstream main units on either side of the power house, making it possible to supply house turbine from either wing. House generators serve the main 2,400-volt station power bus housed in the metal-clad switchgear cubicle shown below. As a supplementary source of station power a 16.5/2.4-kv. bank of transformers, energized from the main powerhouse bus, also feeds the station power bus.

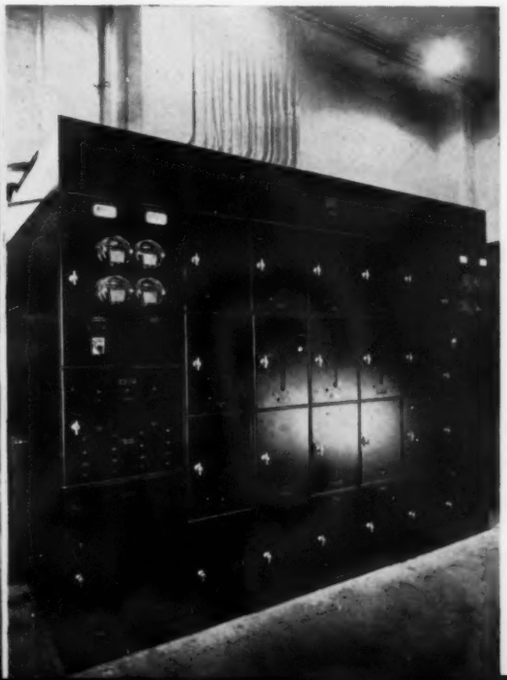
2,400-volt Switchgear cubicles of the metal-clad vertical-lift, draw-out type, serve the station service power feeders. This switchboard, built by the Delta-Star Elect. Co., supplies 2,400-volt power to the various transformer banks which reduce the voltage to 460 volts for all station power requirements or to 110-220 volts for lighting circuits. Because the project is so large it was more economical to locate station power transformer banks near the station service load centers and carry 2.4-kv. feeders to these points rather than attempt to centralize the source of 460-volt power. This switchgear is controlled from the miniature control switchboard in the main control room of the power house (shown on the next page).



Direct Current for the power house is supplied from two sources. The first source consists of two 120-cell Exide storage batteries (above) together with three 550-volt motor-generator sets bussed through the switchboard so that one set floats on the line with each battery and one acts as a spare. The second source consists of a 60-cell battery with two similarly arranged 125-volt m.g. sets. All switch control in the plant is energized from the direct current power sources, 250 volt circuits supplying standby motor-operated auxiliaries and switch, breaker, contactor operating mechanisms. 125-volt d. c. is used for remote control through auxiliary relays and for indication. This view (left) shows the main d. c. switchboard, built by the Square D Co., from which all d. c. circuits emanate.

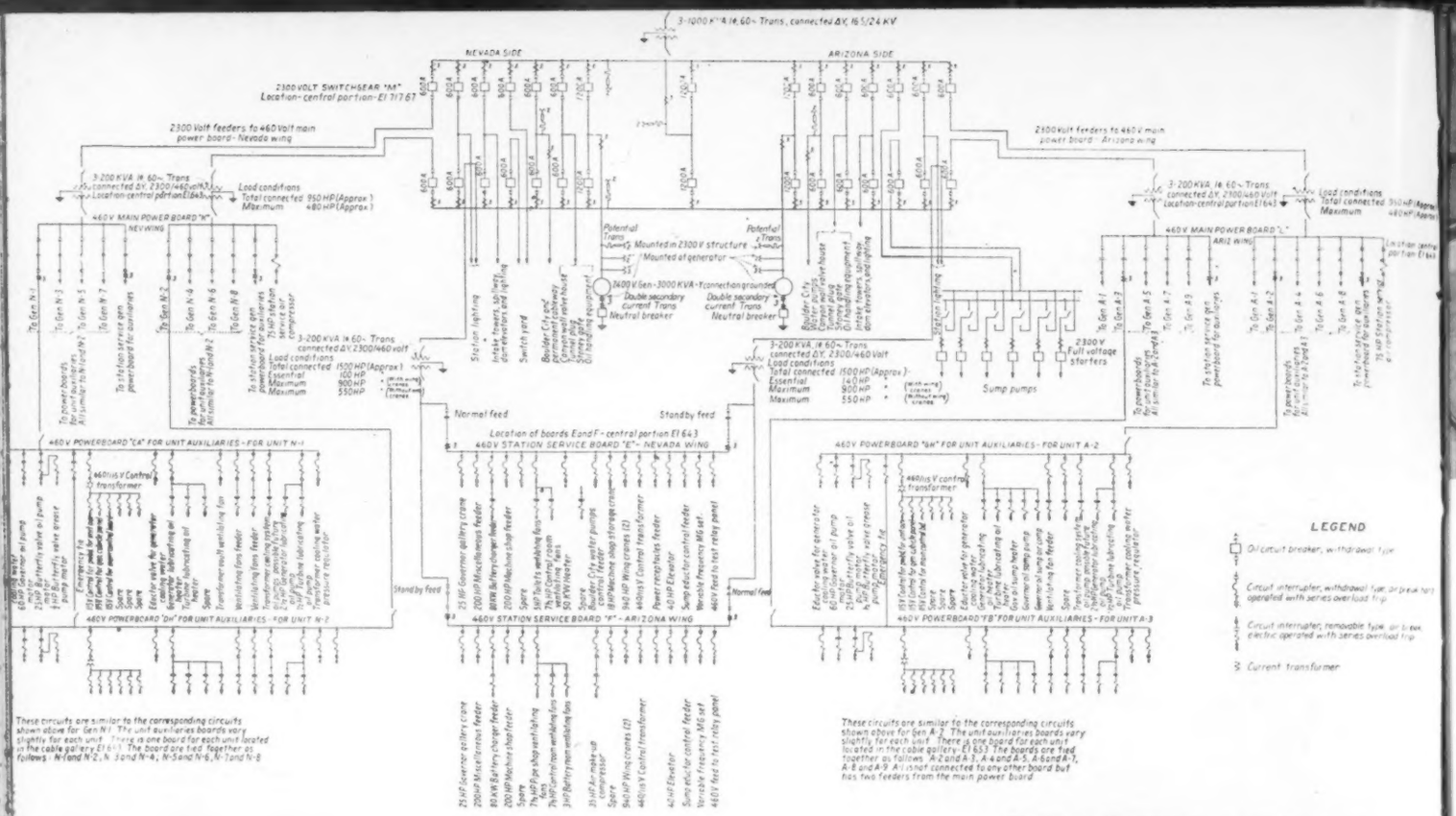






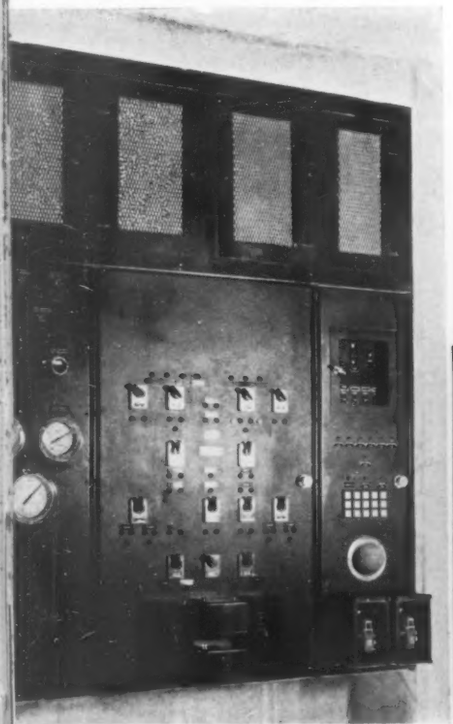
Station Service Load is divided into two groups, all served from four switchboards similar to this one. One group comprises all of the equipment essential to operation of the main units such as oil and lubricating pumps, valve operating motors, etc. These circuits are supplied through four banks of transformers, feeding the 460-volt power distribution switchboards. One bank serves the unit auxiliary power panels for each of the even numbered main generating units in one wing; a second, the odd numbered units in that wing, and the remaining two banks serve the generating units in the other wing in a similar manner. Cross connections on the 460-volt buses permit power to be obtained from either bank serving one wing. The second group serves non-essential equipment, such as cranes, machine tools, etc., power being obtained from a transformer bank supplying each wing.

Compactness is a feature of these Roller-Smith switchboards (left). A total of four switchboards, two for the essential auxiliaries in each wing and two for non-essential auxiliaries in each wing, are installed in the central portion of the power house. Air circuit breakers, operated by direct current, are removable from their panel positions by means of the truck shown on the left.


NEVADA SIDE
ARIZONA SIDE
2300 VOLT SWITCHGEAR "M"
460 V MAIN POWER BOARD "K"
460 V MAIN POWER BOARD "L"
460 V STATION SERVICE BOARD "E" - NEVADA WING
460 V STATION SERVICE BOARD "F" - ARIZONA WING
Normal feed
Standby feed
LEGEND

These circuits are similar to the corresponding circuits shown above for Gen N-1. The unit auxiliaries boards vary slightly for each unit. There is one board for each unit located in the cable gallery-El 611. The boards are tied together as follows: N-1 and N-2; N-3 and N-4; N-5 and N-6; N-7 and N-8

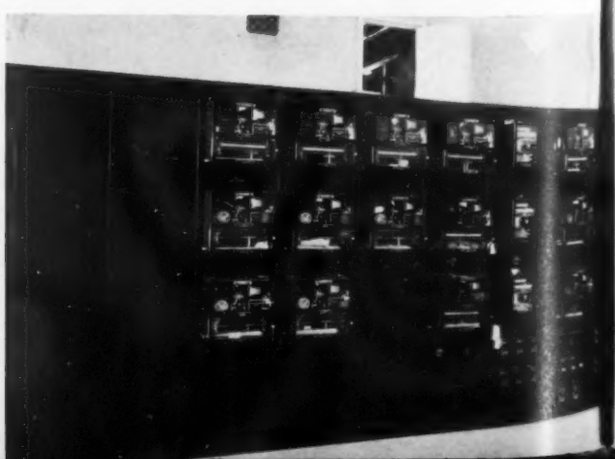
These circuits are similar to the corresponding circuits shown above for Gen A-2. The unit auxiliaries boards vary slightly for each unit. There is one board for each unit located in the cable gallery-El 653. The boards are tied together as follows: A-1 and A-3; A-4 and A-5; A-6 and A-7; A-8 and A-9. A-1 is not connected to any other board but has two feeders from the main power board

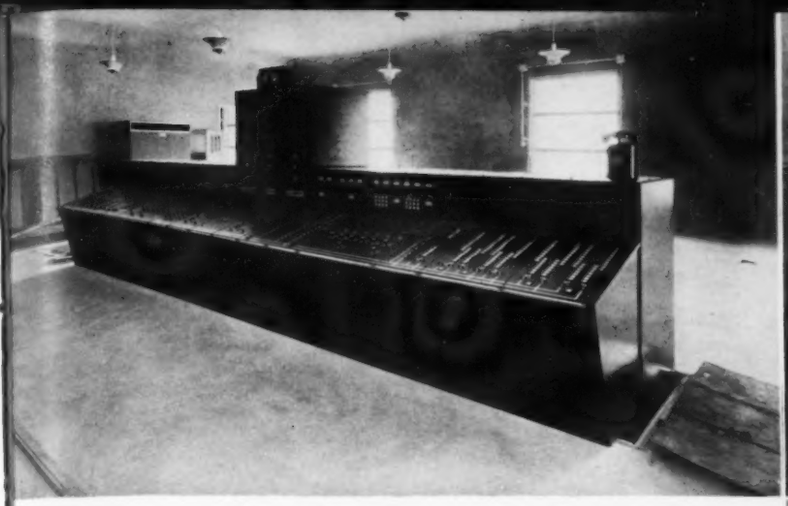


One-Line Diagram of station power circuits. Continuity of operation for all equipment in the power house is obtained by so arranging the power supply for each main unit that it can operate independently of all other units. To this end each unit is equipped with an individual 460-volt auxiliary power panel served by an individual feeder from one of the 460-volt power distribution boards shown on the preceding page. In addition all essential equipment is dual drive, normally from a. c., but from d. c. in emergencies. All governor oil pumps, valve motors, etc., have both a d. c. and an a. c. motor drive.

The Power Output of each main unit is recorded on this totalizing meter board equipped with Leeds and Northrup recording meters. This board is installed adjacent to the control switchboards in the main control room on the upper floor of the central portion of the power house.

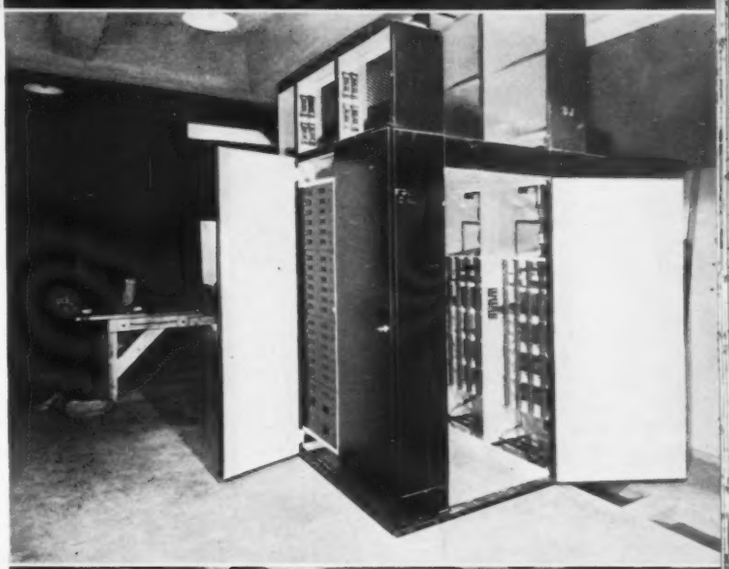
Power for unit auxiliaries is obtained through this power panel (center), there being one such switchboard for each main generating unit installed in the wall of the cable gallery. These power panels contain motor starting switches and magnetic contactors controlling oil pumps, motor-operated valves, blowers and all other equipment essential to the operation of the main unit. Control for these units is centralized on the control board (shown above) which is installed in the governor gallery. Starting operations are interlocked in a sequence so that it is impossible to bring a unit up to speed without having all auxiliaries operating. All of the unit auxiliary power and control panels were supplied by the Cutler-Hammer Co. under specifications of the USBR.





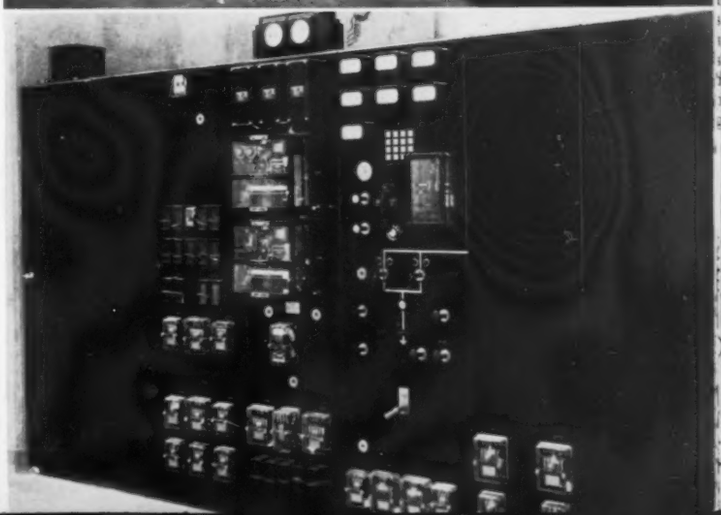
Centralized Control for all equipment in the power house is possible through miniature switchboards of the benchboard type installed on the upper floor of the central portion of the power house. Miniature switches and meters provide the operator with all of the essential information and equipment necessary for switching, loading and synchronizing each unit. Compactness is indicated by the view in the upper right-hand corner which shows all of the meters, instruments and control switches necessary for operation of four main units.

Above is the miniature benchboard controlling all unit auxiliaries in the power house. Here is centralized the switching control for 2,300 and 460-volt switchboards described on the preceding pages. A feature of both the unit auxiliary and main control switchboards is the annunciator system consisting of a series of apertures mounted in the face of the panel through which an alarm light shows when abnormal operating conditions occur on any piece of apparatus. Each annunciator panel is approximately 1½-in. square and the ten or twelve required for each main unit are grouped together for convenient observation by the operator. These groups are visible at the base of the vertical panels of the miniature switchboards.



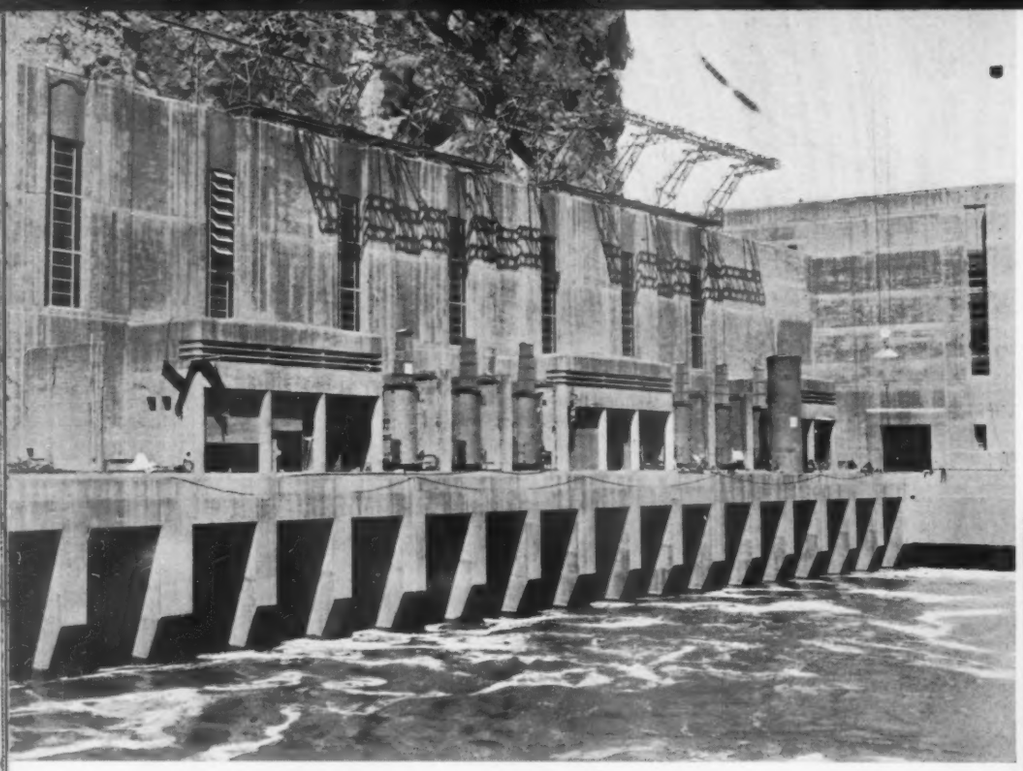
Arrangement of control circuits parallels the layout of the wings shown in the vertical cross-section of the power house on page 13. Immediately below the main control room is the cable terminal room where control cables from the wings and central portion terminate in cabinets located directly under the miniature switchboards and meter boards in the room above. At the left is shown one of the terminal cabinets with the doors open to show the terminal strips which facilitate wiring and maintenance. Connections to the control and meter boards are carried up through the ceiling in metal housings.

Cable Racking Room located directly below the terminal room consists of vertical tiers of Transite trays in which the control cables from all portions of the plant are grouped and carried to their proper positions under their respective terminal boards on the floor above. Lead covered, multi-conductor control cables extend from this room down risers to the cable galleries along each wing where they are supported on trays similar to those shown here.

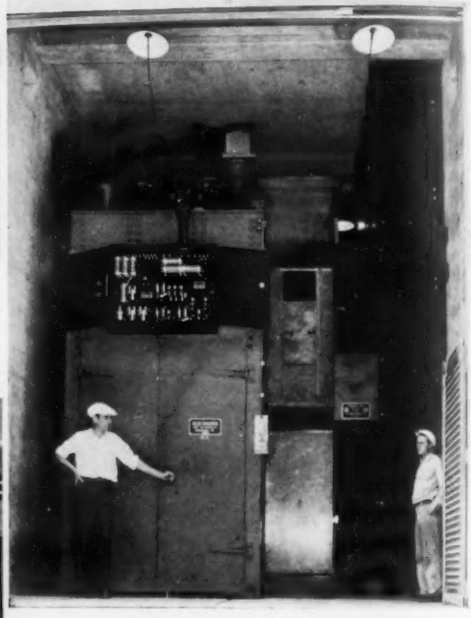


Generator Control Cubicles are installed against the river wall on the operators' gallery overlooking the main generating room adjacent to the units they serve. Hereon are all the control switches for synchronizing, loading and operating the unit. This control is duplicated in its essentials on the miniature benchboard panels in the main control room (see above). However, the operator on the generating floor can either operate the unit from this point via telephone instructions from the main control room or transfer control to that point by means of a switch on this panel. The sequence of operations is such that the operators in the turbine gallery must start the unit auxiliaries and bring the turbine up to speed before the electrical control can function to synchronize the unit and place it on the line.

Through Leeds and Northrup load and frequency control equipment, any unit can be placed on base load, proportionate load or frequency control automatically. Frequency is corrected automatically when deviations exceed 0.01 cycles.

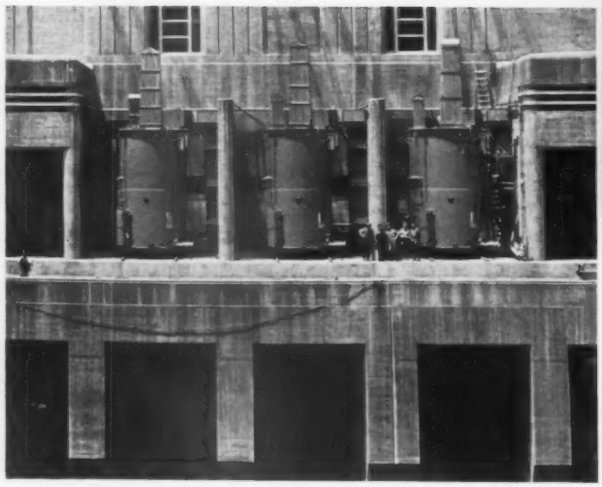


Generators are connected through the 4000-amp., 23-kv. double bus to the main transformer banks. Because of the limited space in the canyon for outgoing circuits, two generators serve one bank of three 16.5/287-kv., 55,000 kva single phase, 60-cycle transformers. The necessary primary switchgear for each generating unit is installed in switchhouses built on the platform outside the main wall of the power house as shown in the accompanying photograph. Between each switch house are three transformer bays in which are installed the transformers supplied from adjacent generating units.



Metalclad Switchgear units for the 23-kv. bus switching arrangement were built by the Allis-Chalmers Mfg. Co. The bus connections to the metalclad units are essentially a continuation of the bus structure described on page 15. The bus riser and connection here is shown at the right.

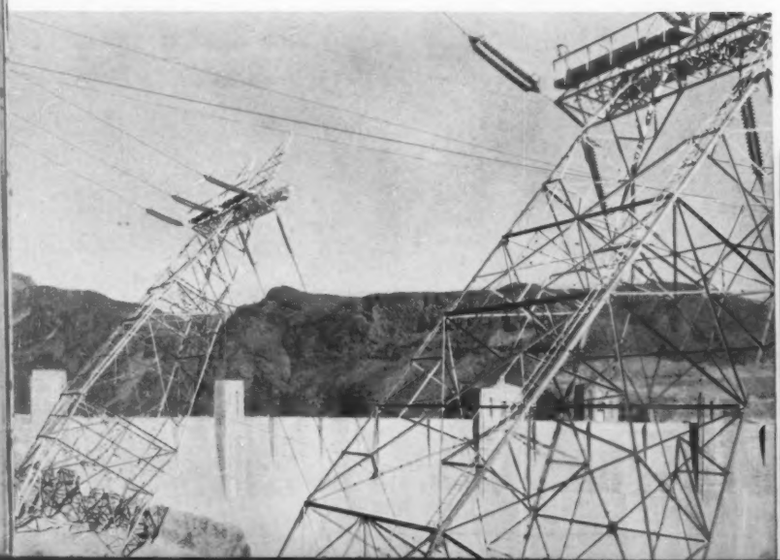
Transformer Bay showing the three 55,000 kva. transformers which step the 16.5-kv. primary voltage up to 287-kv. for transmission. Physically these units, built by General Electric, are the largest in the world, as well as operating at the highest voltage used commercially. They weigh 385,000 lb. (of which 150,000 lb. is oil) and are 32 ft. high. The design is the circular-coil, non-resonating type with a shielded high voltage winding. A water curtain for fire protection is provided in each transformer bay.

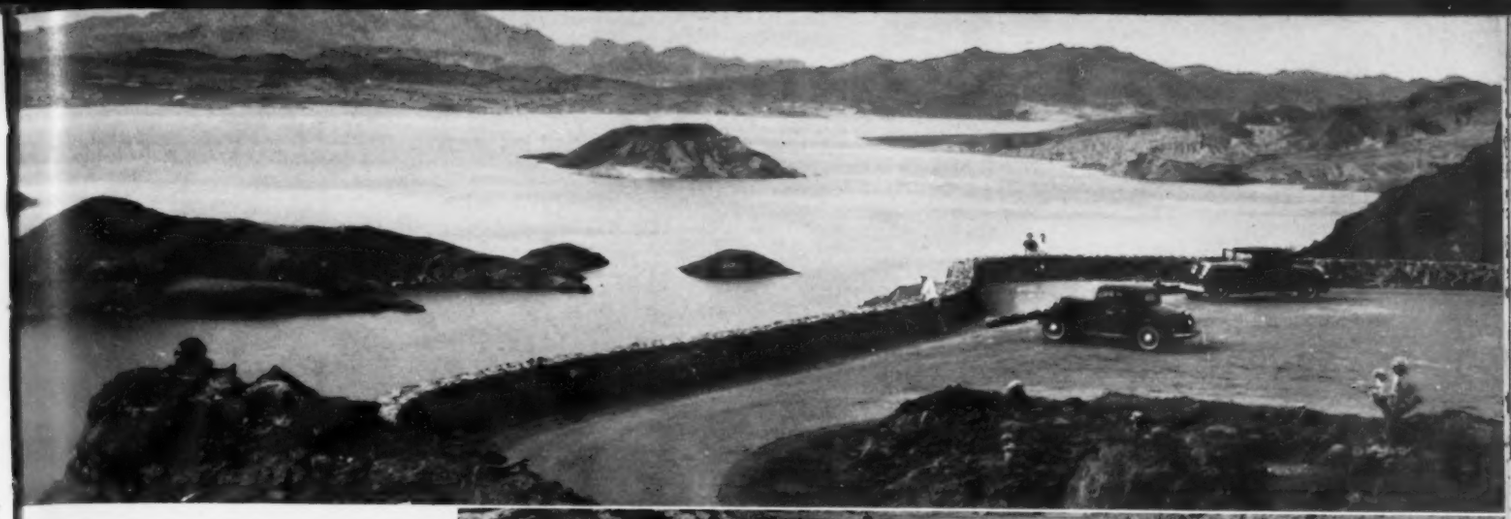


Takeoff Structures for transmission circuits departed from the conventional practice because the circuits leave the power house in a vertical instead of horizontal plane. On the roof of the power house is mounted an overhanging steel rack (see upper left) which supports conductors from the high voltage bushing of the transformer banks immediately below.

From this point the conductors run vertically to the overhanging transmission towers installed at almost a 45-deg. angle on the rim of the canyon and from there on conventional towers to the 287-kv. switchyard.

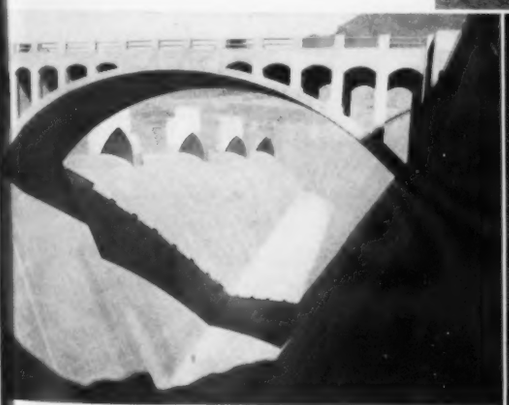
On the Roof Structure of the station a 3-phase lightning arrestor for each circuit, and the 3-pole 287-kv. disconnecting switch necessary to isolate it from the line, are installed. Also installed is an interesting counterweight device for each conductor which maintains sufficient tension in the vertical rise of the cable to keep it from swinging either into the canyon wall or adjacent conductors. The counterweight (see below) consists of a weight suspended from the conductor over a double sheave to keep it from twisting, the necessary insulation in the suspension being provided by a double string of insulators.





Lake Mead, the 115-mile body of water formed behind Boulder Dam, was named in honor of Elwood Mead, former Commissioner of the United States Bureau of Reclamation, who died during the construction of his Bureau's greatest project.

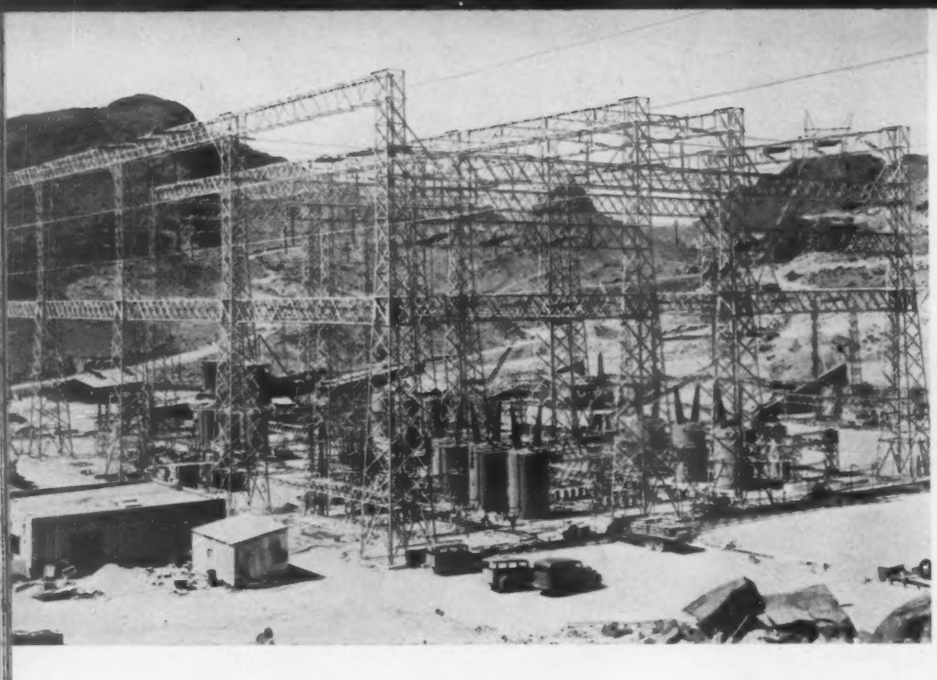
General View of the dam taken from the Arizona side showing the roadway across the dam which provides a highway link between Las Vegas, Nevada, and Kingman, Ariz., and eliminates the need for a ferry across the river.



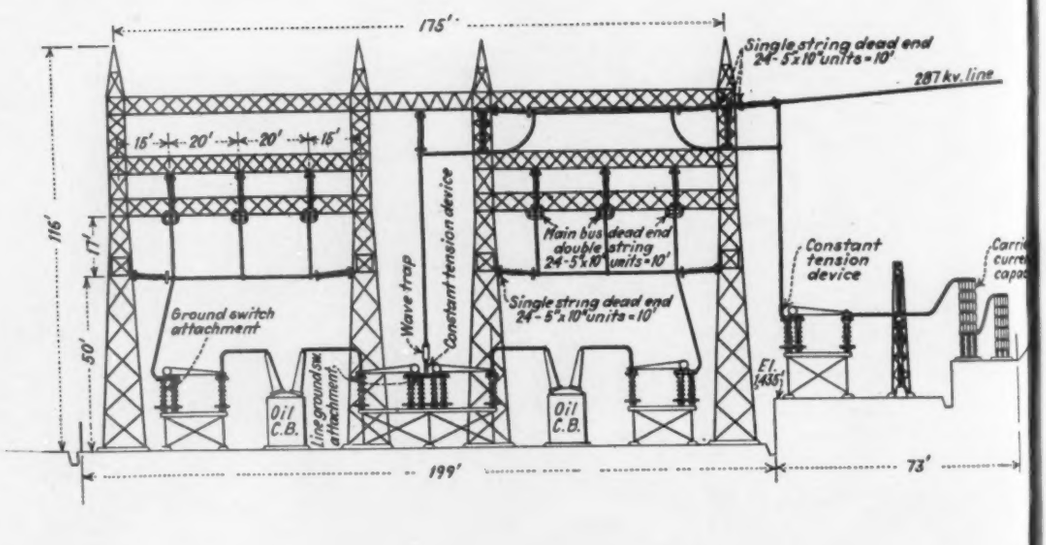
Spillway on the Arizona side. Dimensions: 650 ft. long; 150-ft. wide and 120 ft. deep. Four steel drum gates, each 100 ft. long and 16 ft. high, are installed along the crest. Spillway capacity—200,000 sec. ft. of flow. The dot at the bottom is a man.

Night View of the cascade flowing from the outlet valve houses in the canyon wall.

Outlet Valve House gate valve operator (lower left) and (lower right) the operating mechanism which controls the circular steel gates in the intake towers.

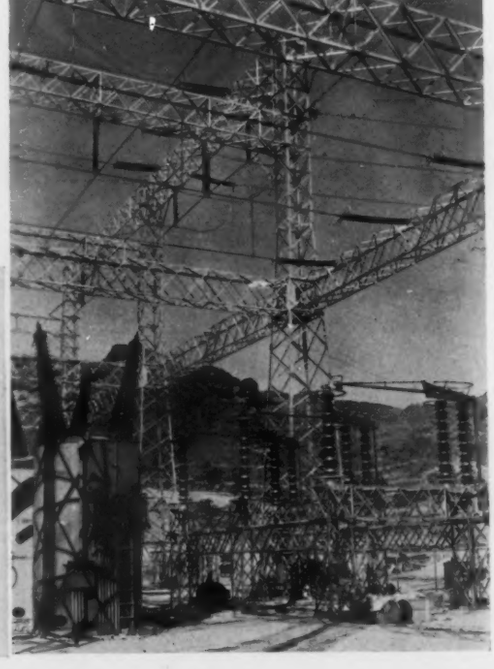


Boulder Dam Switchyard is located on the Nevada rim of the canyon. Each 287-kv. transmission circuit from the power house is connected to one side of the double bus that runs longitudinally through the switchyard. The double bus is cross-connected by a double set of disconnecting switches and high-speed oil circuit breakers, the midpoints of these two cross buses being the take-off points for the two circuits. The cross-section drawing below and the diagram on page 12 indicate the physical and electrical arrangement of circuits and apparatus.



Lightning Arrestors for the switchyard and switching stations present an unusual appearance. The central column is the 287-kv. Thyrite arrestor itself being supported by the three strings of insulators around the outside. The bottom of the assembly is secured to the base through a spring tension to keep it from swaying. Electrostatic stresses are distributed over the entire length of the arrestor by the circular shield arrangement around the top.

Detail view (right) of one of the 287-kv. Bowie disconnecting switches and the Westinghouse high-speed de-ion oil circuit breakers which are installed in the switchyard. The breakers are designed to interrupt 2,500,000 kva. in less than 3 cycles. Close-up of the disconnecting switch contact (below) showing the protective hood over the moveable blade contact which protects against freezing and corrosion as well as decreasing the liability of corona formation.



287-kv. Chosen For Transmission

Utilization of Boulder Canyon power presented an entirely new problem to transmission engineers. Although the greatest amount of the Colorado's potential energy could be developed most economically at the upper Black Canyon site where the project is located, the primary market for a major portion of the electrical energy was in the metropolitan areas of Southern California almost 300 miles away. Studies concerning the transmission of the huge blocks of energy made available by the project early revealed that the conventional maximum transmission voltage of 220-kv. would not be practical from the economic standpoint, other elements such as stability, reliability and losses being considered.

At least two of the power distributing agencies rely upon the project as a major energy source for their power requirements. Reliability, therefore, is of prime importance. Equally important from the financial standpoint was economy both in investment and operating costs. Coordinating these two factors into the final design of the first two circuits from the Boulder Canyon project has resulted a very definite contribution to the technique of power transmission and has set a new standard for commercial practice for long distance, heavy duty transmission circuits.

As contractor for the power of the first four main generating units completed in the Boulder power house, the Los Angeles Bureau of Power and Light was the first distributing agency confronted with the problem of power transmission from the project. All credit is due to its engineers for successfully conducting the necessary research and development work, and for the independent pioneering that has achieved a design making the utilization of Boulder Canyon power economically feasible.

Reliability in transmission is affected by the electrical characteristics of the system and by external causes such as storms, accidents and mechanical failure. Dynamic stability or the ability of the transmission system and generators connected thereto to continue to supply power at normal frequency and voltage despite sudden changes in the electrical characteristics is most important in determining the maximum amount of power that can be transmitted over a given circuit. Factors affecting the stability are, among others, the voltage, electrical constants of the circuits, the electrical characteristics of the generating equipment and the speed with which faulty sections of line can be isolated from service. Stability calculations on the basis of the Bureau of Power and Light's 240,000 kw. allotment of power for voltages between 220 and 330 kv. indicated that with two 220 kv. circuits and 300,000 kva. of low reactance generators, the theoretical power limit would be 150,000 kw.; with three 220-kv. circuits, 280,000 kw.; and with two 287-kv. circuits, 265,000 kw. The two 287-kv. circuits were 17 per cent more economical than the three 220-kv. circuits. While, in theory, 330-kv. circuits would have had a still higher power limit, the costs of conductor and apparatus was prohibitive. Therefore 287-kv. was selected at the voltage for the Bureau's two transmission circuits. As the amount of power capable of being transmitted was increased 40,000 by low reactance generators, it was possible to justify a liberal design of the units which have a 17.5 per cent reactance and a short circuit ratio of 2.4 at 60 cycles, making it possible to transmit a total load of 300,000 kw. over the two 287-kv. circuits.

The rating of this transmission system is based upon its ability to interrupt a two-conductor-to-ground fault without losing synchronism. To accomplish this, faults must be tripped off the circuits within three cycles, a requirement heretofore thought impossible with the large equipment necessary for circuits of this capacity but one which has been met successfully by new designs of circuit breakers and relays.

Studies also revealed that sectionalizing the line into three parts by means of two switching stations increased stability and was economically justified over one sectionalizing station at the midpoint. Right-of-way and other considerations dictated the use of two single circuits from Boulder Dam for 225 miles and a double circuit tower line the last 40 miles.

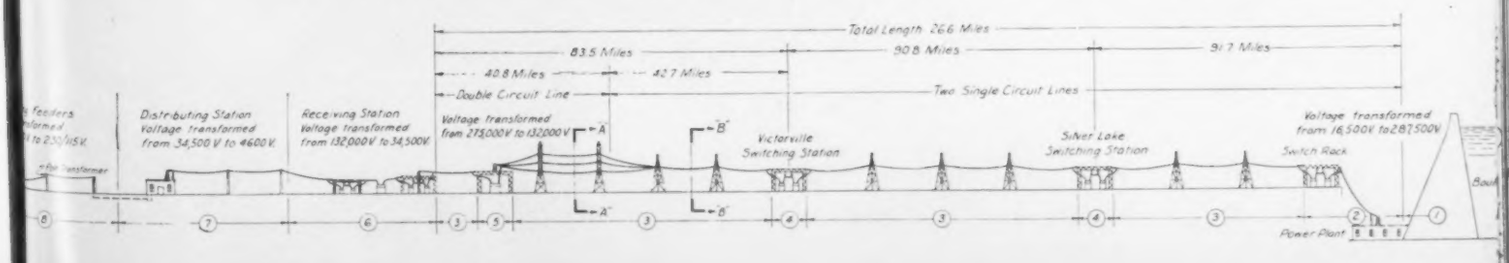
With these characteristics determined, attention was given to the design of equipment for this pioneer application of 287-kv. as a commercial voltage. Towers of sufficient height and strength to maintain clearances to permit economical span lengths with safety to the public and economy in investment had to be designed. Efficiency of transmission required a large diameter conductor (to limit corona losses) without an excessive copper area which would have increased both the cost of the cable and the size of the towers necessary to support the increased load. To fulfill this requirement a new type of hollow conductor was adopted and used for the first time in this country.

Efficient lightning protection for the line was devised through the use of two overhead ground wires and a counterpoise net buried under the circuits and bonded through an air gap to the legs of each tower. New switchgear, capable of rupturing the tremendous currents possible at short circuit in 0.11 seconds, had to be developed by the manufacturers. Transformers had to be designed for a new high voltage. Cable connectors, suspension clamps, practically everything associated with the line represents pioneer effort.

For control, communication and relaying, carrier current is used, there being four separate carrier frequencies superimposed on the transmission circuits. One is used for operation of the lock-out directional relay protective scheme; the second for supervisory control of circuit breakers and disconnecting switches at the switching stations; the third for telephone communication, and the fourth represents an innovation whereby communication is maintained with the patrol car maintenance crews by broadcast via the carrier current system. Switching control is normally from Boulder power house, but indications of switch positions also are carried to the main dispatching room of the Bureau of Power and Light in Los Angeles.

On succeeding pages will be found the engineering features of this pioneer application of 287-kv. recorded in pictorial form. The advanced design of the first of the Boulder Dam transmission circuits represents a definite step forward in the art of power transmission and widens the field for the effective and economical exploitation of water power resources everywhere.

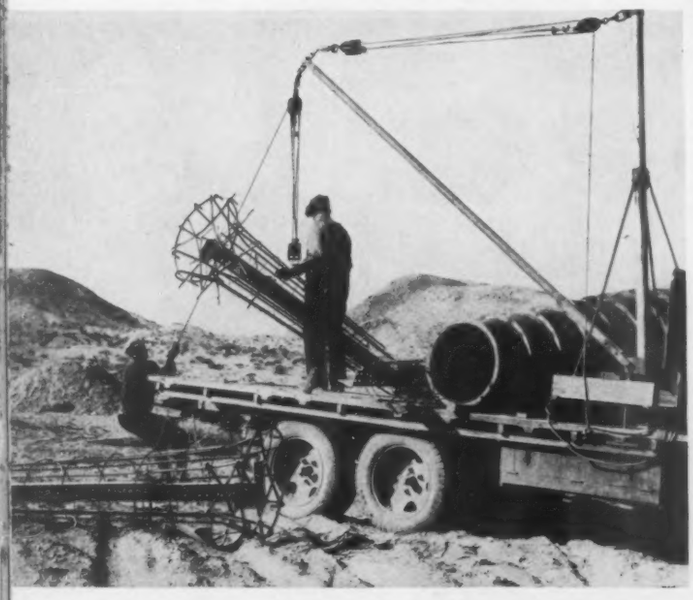
Boulder Power Transmission Circuits of the Los Angeles Bureau of Power & Light



TOWERS

Forms of steel in the shape of a 30-deg. truncated cone were set in holes dug in the ground to provide reinforced concrete tower footings of the correct size for the new design of towers used on the 287-kv. transmission circuits. The excavation for these footings was undercut to develop maximum resistance to uplift in largely undisturbed soil. For single-circuit towers the concrete footing is 7-ft. deep and has a base diameter of 48-in. Tests of typical footings prior to erection of the towers confirmed the strength of the design.

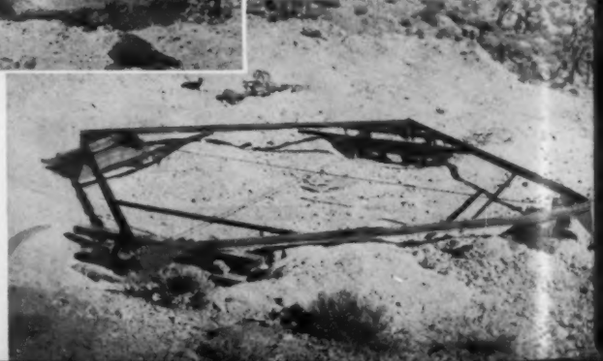
Reinforcing Steel for the footings was fabricated as a unit in the field by electrically welding the steel bars around the angle iron stub to which the structural members above ground are bolted. A series of footing stubs of different lengths was designed to take care of the differences in soil, slope and other conditions of the terrain encountered along the route.



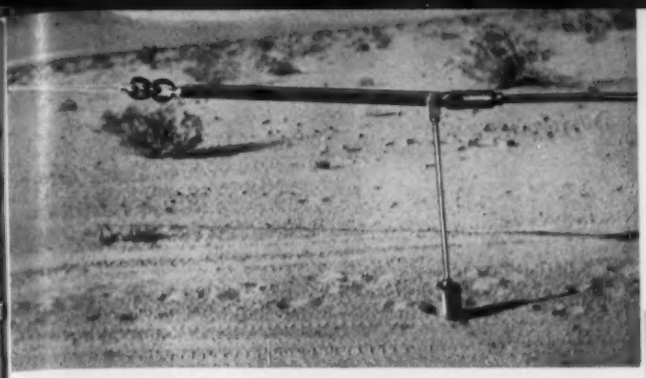
Placement of the forms and reinforcing steel was facilitated by the unit design. Steel forms and reinforcing units were easily transported in groups by means of trucks to the various locations. Light tackle rigged on the truck simplified loading and unloading and speeded the erection procedure.

Concrete Mixing (left above) was complicated by the lack of water in the desert area. Special, truck-mounted portable concrete mixing plants of a very compact design were developed to expedite concrete placement in the forms of the tower footings. Sand and aggregate were found in suitable quantities and qualities at several locations along the route. Continuous testing of representative samples of concrete being used in the footings insured the requisite strength was being maintained. Waterproofing was applied to the exterior of the footing before the backfill was made and the footing left for the steel erectors.

Completed Tower Footin ready for the assembly of the tow steel. Concrete is carried well abo the ground line to protect the memb from corrosion. In this view the exteri surface of the concrete has been tre ed with a waterproofing compound a the backfill made.

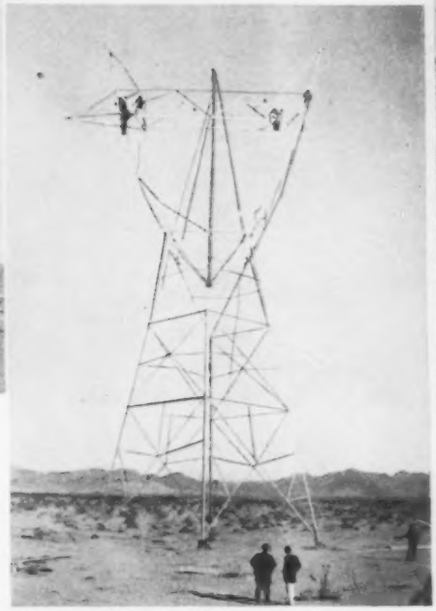


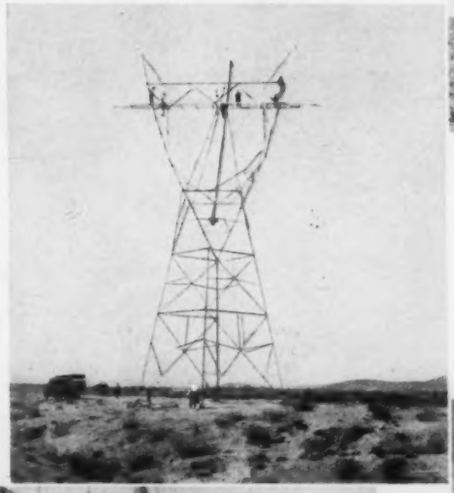
Templates of steel, to which the studs of the footings were bolted during their construction, insured correct alignment for subsequent operations. Templates consisted of a light angle iron frame suitably reinforced to maintain rigidity.



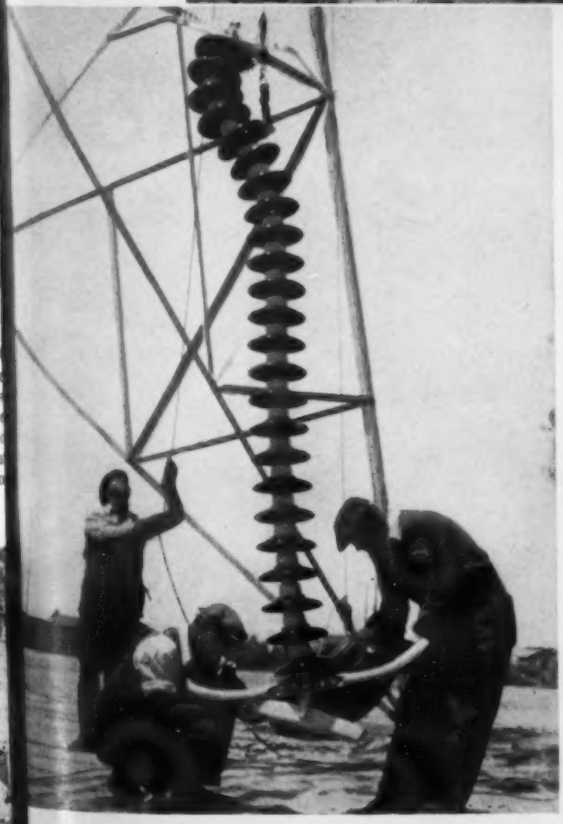
Counterweight device used to maintain the cable in proper position during the stringing operations. This innovation was one of the many new contributions to transmission line technique made necessary in designing the first line for 287-kv. operation. It prevented possible twisting action of the cable due to its segmental spiraled construction.

Tower Erection was accomplished in sections which were assembled on the ground, raised into position, and bolted into place. Special rigging on a light stiff-leg derrick which was raised with the steelwork facilitated erection. Single circuit towers are of the narrow-waisted type with the base rotated 45-deg. with respect to the direction of the line. Several tower designs were investigated but the rotated base type with the narrow waist was slightly lighter for the same strength and required smaller footing reactions which permitted economies in the design of the footings. The base of these towers is 32-ft. square; the overall height to the ground wire supports, 109 ft. 2 in.; overall width of the crossmember supporting the insulator strings, 65 ft. Views of completed towers of various types will be found on page 28 together with detailed specifications.





Hardware for the 287-kv. line also demanded a new design without the benefit of precedent or previous experience. This is a dead-end clamp utilizing the clamping action of a tapering sleeve to provide the requisite mechanical strength in holding the tubular conductor in position.

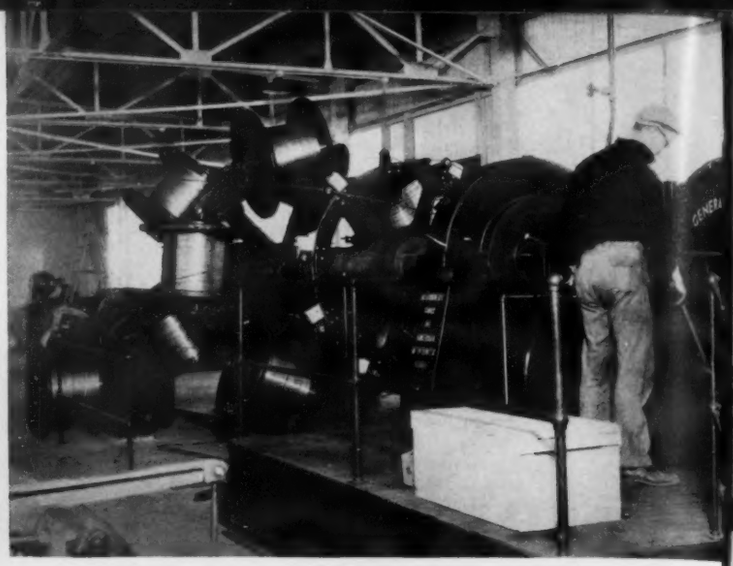


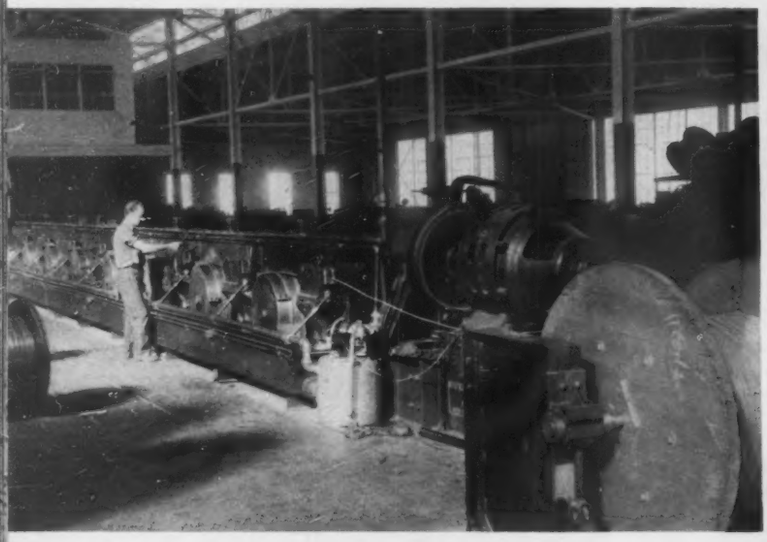
Insulator String for a tangent suspension tower consists of 24 10-in. Ohio Brass insulator units spaced 5-in. apart. In the selection of the length of insulator string, lightning flashover values rather than normal operating voltage are the criterion. Insulation value for this line was coordinated with the overhead ground wire-counterpoise protection against lightning and is designed to limit power arcs following lightning flashovers to minimum values despite the fairly frequent lightning storms experienced along the route of the line.

Arcing horns 30-in. in diameter in the plane of swing are mounted at either end of the insulator string, the lower arcing horn being 1-ft. above the conductor. For a wind pressure equivalent to 40 miles per hour velocity, a full clearance of 11 ft. between the conductor and the tower is maintained. Under a wind pressure of 12 lb. per sq. ft., the minimum clearance is 7 ft., which is 4½ times normal operating voltage and considered sufficient protection against switching surge flashovers.

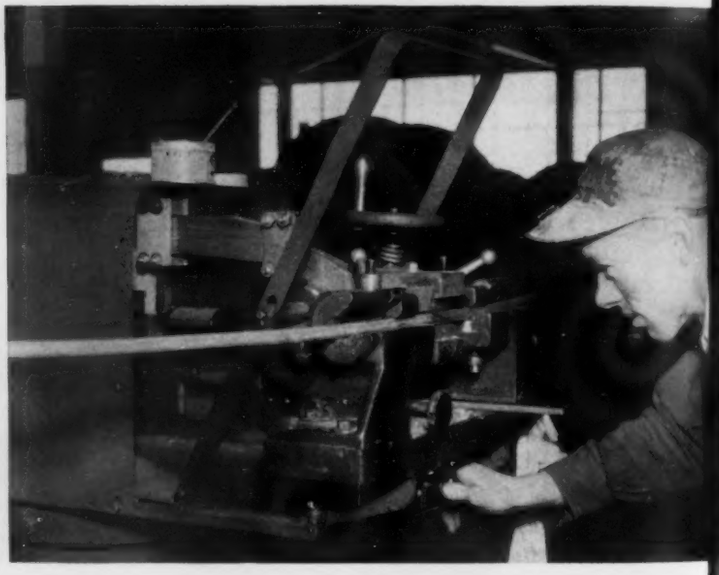
Transposition tower for double circuit section.

Conductor selection for a line operating at 287-kv. also was without precedent. At this voltage, the diameter of the conductor must be large enough to limit corona formation and attendant losses to a reasonable figure. A large diameter, however, implies a much larger cross section of copper than is necessary for transmitting the current economically. Numerous designs, incorporating various methods of limiting copper area and weight without sacrificing strength or the diameter of the cable, were tested. The design finally selected was originally a German development manufactured in this country by the General Cable Co. under the designation "Type HH." It is of tubular construction, 1.4 in. in diameter and the size used on this line has a copper area of 512,000 circ. mils

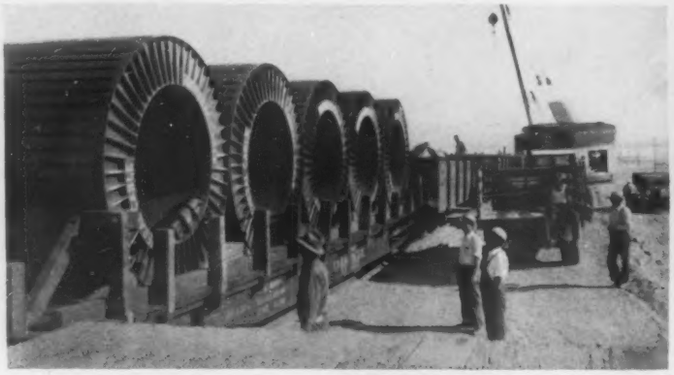




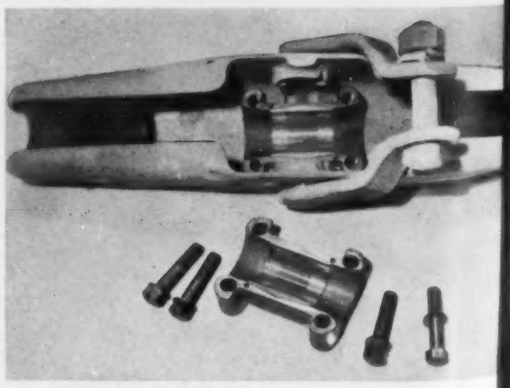
Forming the cable is accomplished in this machine which draws ten of the tongue and groove segments through a special head which closes adjacent tongues and grooves so that they are interlocked together in a spiraled form.



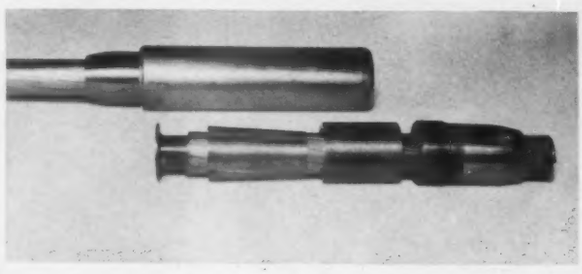
Drawing the segments is accomplished in the conventional manner with the exception that special dies which form a lip or tongue on one side of the segment and a corresponding groove on the other are used. The segments are drawn from copper rods welded together in the machine shown at the right to form a continuous rod one mile in length.

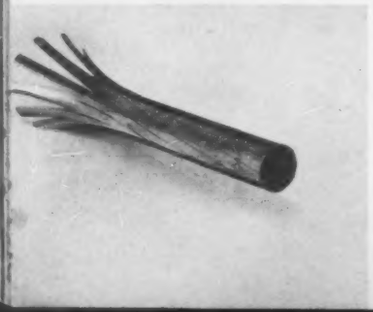


Connector for joining two pieces of the Type HH cable is of a new design. Extremely simple both in construction and installation, the connector consists of (1) an inner hollow plug which fits inside the conductor, (2) a tapered sleeve over which fits a (3) mating taper sleeve driven by (4) a threaded plug. This latter screws into the outer sleeve common to the two halves of the joint.



Cable view showing the ten copper segments being drawn down, interlocked and forming the smooth-surfaced hollow conductor. The spiral construction is clearly evident. Diameter: 1.4 inches. Weight per ft.: 1.57 lb.

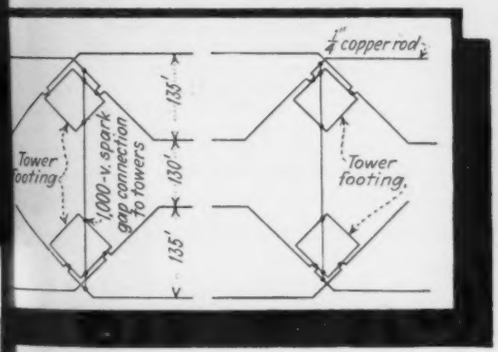




Suspension Clamp also was original in design incorporates interesting features, not the least important of which is the "free center" suspension arrangement. The clamp consists of a metal shell at either end of which are two saddles supported on knife edges and free to rock in the vertical plane. On these the cable rests. The distance between the two centers of the saddles is one-half a spiral pitch of the cable. Attached to the cable and normally free from the clamp itself is the clamping piece, consisting of a double conical wedge in the center. Should the cable break, the clamping piece engages bosses in the shell and exerts clamping action on the cable through the wedge design.

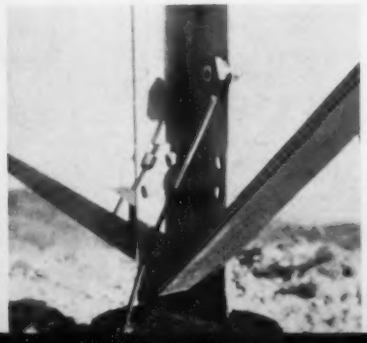
PRINT IN BINDING

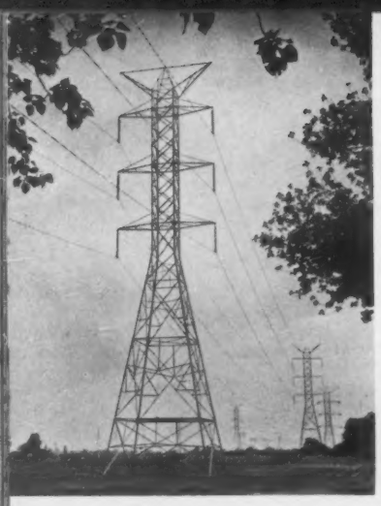
Cable Stringing was simplified with the special equipment shown in the accompanying views. At the upper left is shown the bull wheel around which several turns of cable were placed to maintain proper tension during the time the cable was being pulled into position. The cable was pulled from the reel set up behind the bull wheel, over the latter and attached to a steel messenger which was carried through the blocks suspended on the towers. The messenger cable terminated on the drum of a tractor-mounted winch located five spans away, the winch supplying the power required to pull the cable into position. Telephone communication was established between the bull wheel operator and the tractor operator. Care was exercised to prevent the cable from twisting by the use of counterweights and guide ropes during the stringing operations.



A Counterpoise was buried in the ground along the entire length of the transmission circuits as the best means of reducing tower footing impedance to between 17 and 25 ohms, the value which would reduce lightning flashovers to the desired value of a maximum of two per year per 100 miles of circuit. The counterpoise consists of two ½-in. black copper rods per circuit buried 3-ft. in the ground in the configuration shown in the accompanying diagram. This configuration combines the low surge impedance of the radial counterpoise with complete continuity. The counterpoise wires are cross-connected at each tower and bonded thereto at two points by means of a special connector bolted to the tower (see lower left). This connector consists of two parts separated by an air gap designed to break down under a 1,000-volt potential between the tower and the counterpoise wire. This permits ample protection in case lightning strikes the overhead ground wires and goes to ground through the tower but does not permit electrolytic corrosion which might be experienced in the alkali soil if copper and steel were bonded together.

A Counterpoise Plow buried and covered the counterpoise rod in one operation. The plow was pulled by a tractor and, in spite of the difficulties of terrain which were encountered along the route, operated very successfully and economically. The rod was carried on reels mounted on the plow as shown on the extreme right below.

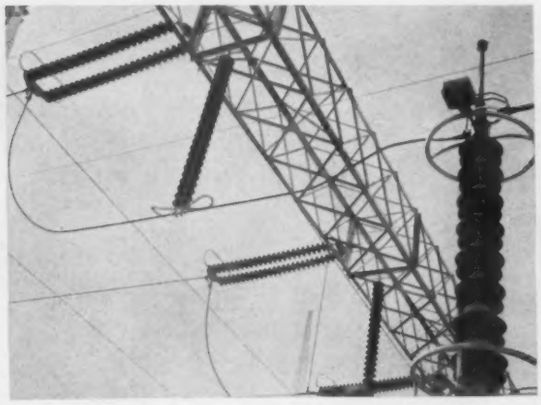




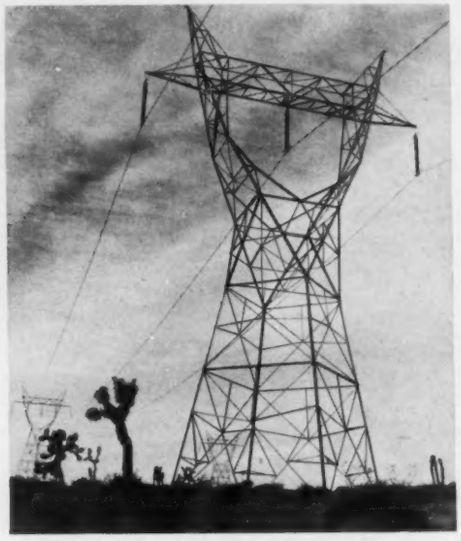
Double Circuit suspension tower typical of those at the western end of the line. These towers are 144 ft. high and have three 41-ft. crossarms located 24.5 ft. apart vertically, the lowest being 175 ft. above the ground. Groundwires are carried at the outermost ends of the upper member spaced 40 ft. apart. Circuit configuration is vertical, one three-phase circuit being carried on either side of the tower. These towers are designed for a maximum pull of 8,750 lbs. and provide minimum clearance between conductor and ground of 45 ft.

Single Circuit Tower of the suspension type. These towers are 109 ft. high, are built of steel having a high elastic limit, and will withstand a maximum loading of 8,700 lb., 40 per cent of the ultimate strength. Under normal temperatures of 60 deg. F., conductor tension is 4,370 lb.

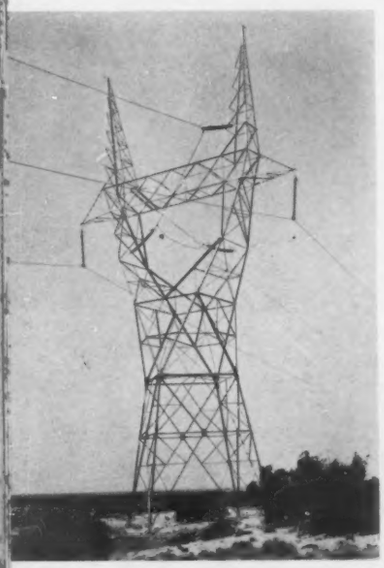
Overhead ground wires protect the conductors from lightning strokes, the ground wires being 7-strand galvanized steel mounted 32 ft. above the conductors with a horizontal separation of 50-ft. The use of two ground wires decreased the surge impedence, increased the coupling factor to the conductors and provides a more reliable shielding than could have been obtained with one ground wire without going to an uneconomical height.



Detail (right) of the dead end arrangement at switching station terminals shows the method of supporting the conductor on a double string of insulators and then carrying it to the disconnecting switch terminal.

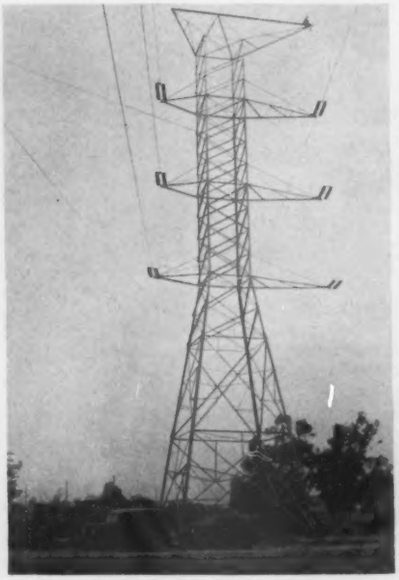


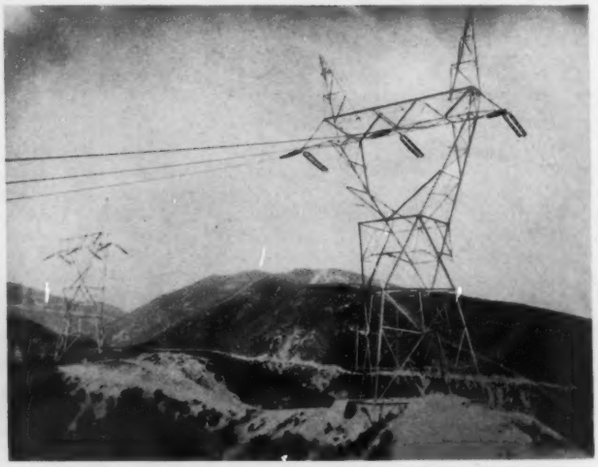
Statistics. The total number of single-circuit towers used in the line is 2,422 producing an average span of 984 ft. Maximum span: 1,811 ft.; minimum span, 431 ft. The total number of double-circuit towers used is 257 in a distance of 40.8 miles giving an average span length of 839 ft. Maximum span length: 1,620 ft.; minimum span length, 331 ft.



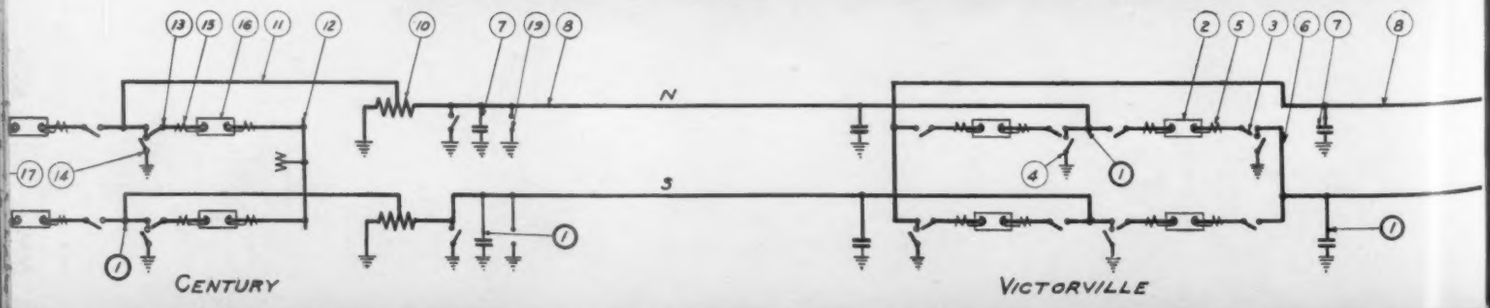
Angle Tower of the double circuit type shows the modifications of design of the crossarms to meet specific loading requirements.

Dead-End Towers of the single circuit design. Both circuits are visible in this photograph and close inspection will reveal an automobile near the closest tower which provides a medium of estimating the tremendous size of these structures.

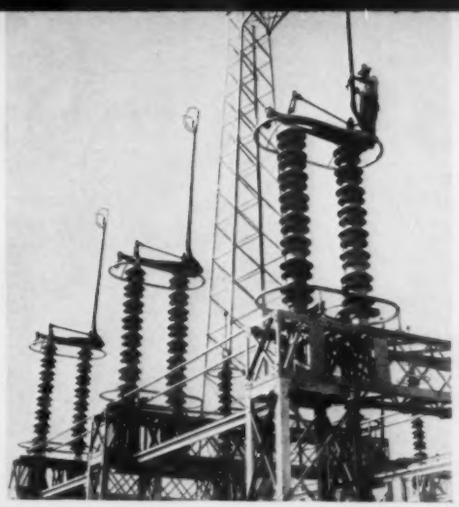




Transpositions on the two single circuits were accomplished by the design of towers shown above and spaced every 30 miles in the sending end and middle sections of the line to give a complete "barrel" transposition. On the double circuit towers, possibilities of interference with communications circuits require three "barrel" transpositions. All transpositions both on the single and double circuit towers were made by a re-design of the standard tower.

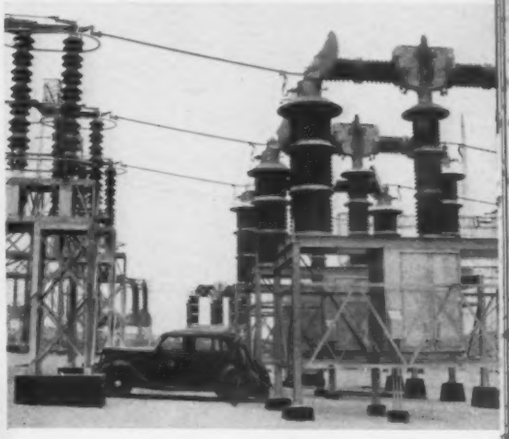


Stability requirements dictated the use of two switching stations dividing the transmission circuits into thirds. These stations primarily permit isolation of a fault by cutting out 90 miles of circuit, the transmission circuits being designed with sufficient capacity so that one circuit can carry the full output from the four Boulder canyon generators without exceeding the power limit of the system. The switching stations consist essentially of high-speed oil circuit breakers and disconnecting switches all of which are operated normally through supervisory control from Boulder power house. The new design of circuit breakers, described elsewhere on this page, does not require the conventional concrete platform for installation, concrete footing blocks being all that are necessary. Thus it is that the foundations for the equipment at these switching stations as shown below is of a very unusual appearance.

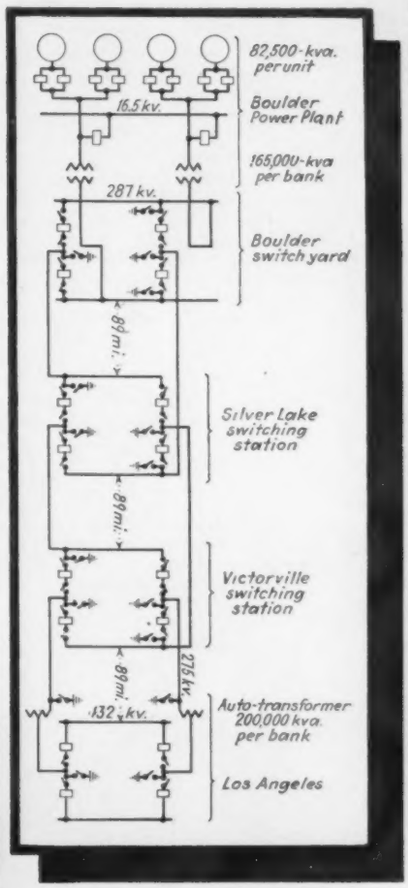


Detail of the 1,200-amp., 287-kv disconnecting switches, built by Delta-Star Electric Co., used in the switching stations. The switches are gang operated and are shown here in their open position.

New Oil Circuit Breakers were designed by General Electric engineers to meet the ultra-high speed switching requirements of the system. These breakers are of the impulse type and will interrupt 5,000 amp. at 287 kv. in less than 3 cycles or 0.11 seconds. They have eight breaks in series housed in the horizontal insulating tube. As the breaker opens, impelled by a strong spring, oil under 100-lb. pressure is forced across each break to extinguish the arc formed there. Each 3-phase group of single phase units occupies an area 22x54 ft. and stands 27 ft. high. Only 2,600 gallons of oil, approximately 10 per cent of that required by a conventional breaker of this size, is required for a 3-phase unit. Of this amount only 210 gallons are exposed to the arc. This feature preserves insulating qualities of the oil, limits the weight of the switch, and simplifies oil handling in isolated locations such as those of these desert switching stations.

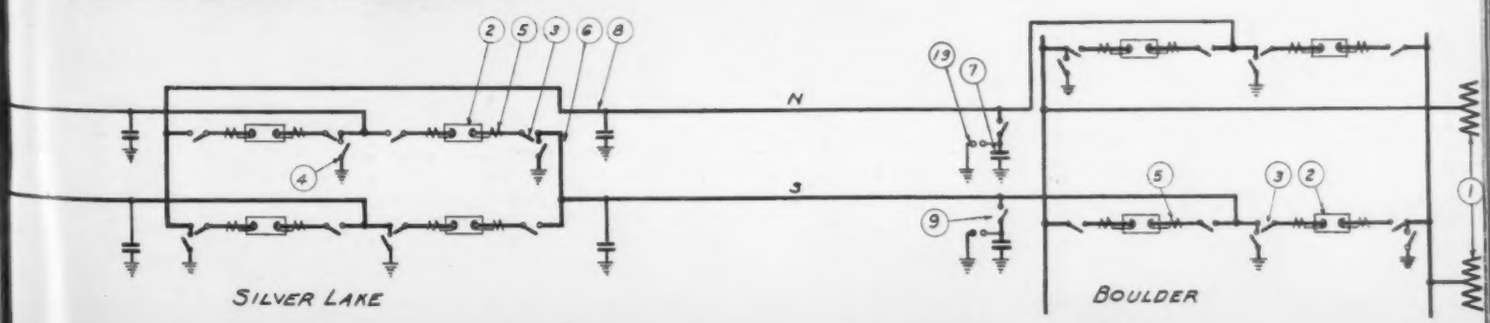


General View of the equipment in one of the switching stations. In the center will be seen a high structural steel tower called a diverter tower the purpose of which is to protect the station from direct lightning strokes. Four of these towers are installed at each station and provide the terminals for the overhead ground wires. Under the station, the counterpoise wires are fanned out into a protective network which is bonded to the diverter towers.



One Line Diagram of the transmission circuits (above) showing the general relationship of the generating and transmission system and the connections at the various switching centers.

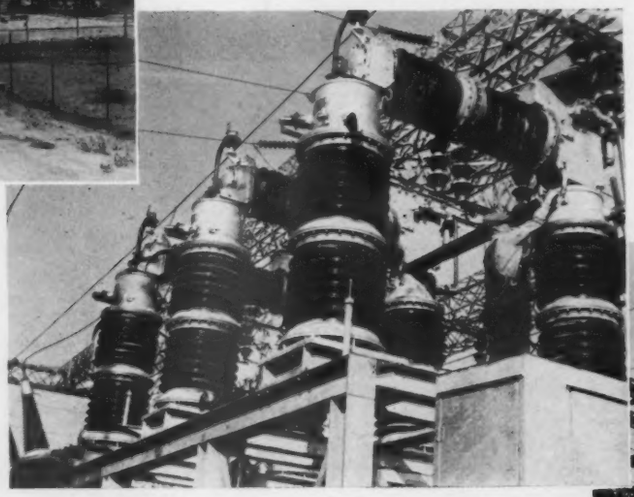
Key to the circuit diagram below. Important apparatus indicated by numbers is (1) main transformers; (2) high speed o.c.b.'s; (3) 287-kv. disconnects; (4) ground switch; (5) current transformer; (6) 287-kv. bus; (7) coupling capacitor for carrier current. The other numbers indicate similar equipment on the 132-kv. circuits at the receiving station.



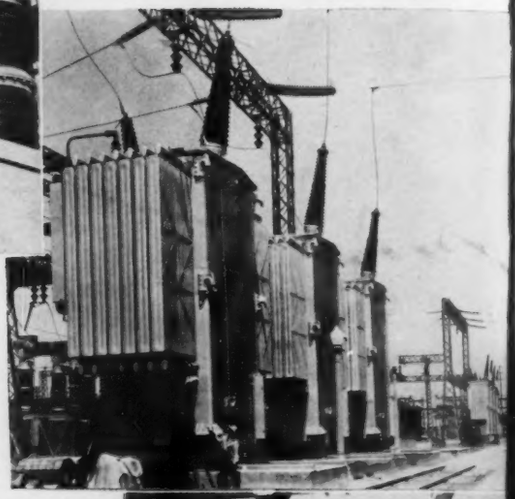
PRINT IN BINDING

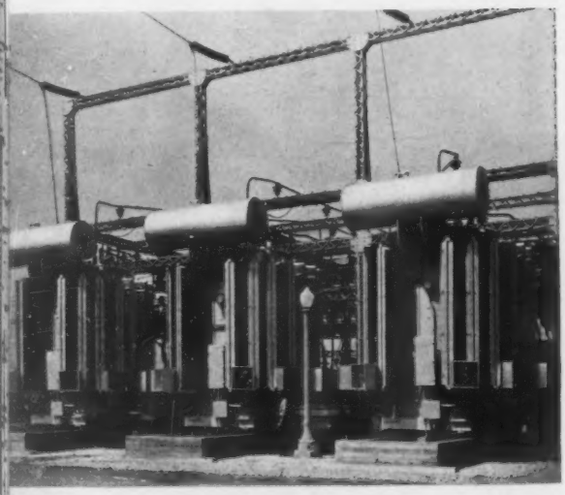
RECEIVING

Terminal Rack at Receiving Station "B" of the Los Angeles Bureau of Power and Light where Boulder Canyon transmission circuits feed into the 132-kv. transmission loop around the city.

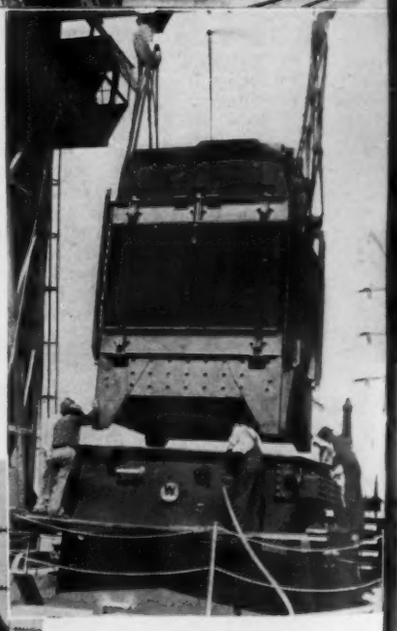


Impulse Breakers (left), rated 1,200 amp., 132-kv., having an interrupting capacity of 2,500,000 kva., are connected between the step-down transformer bank and the 132-kv. bus of the station.

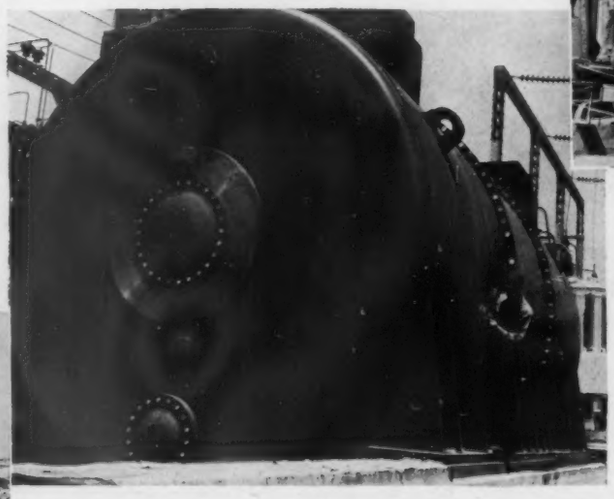




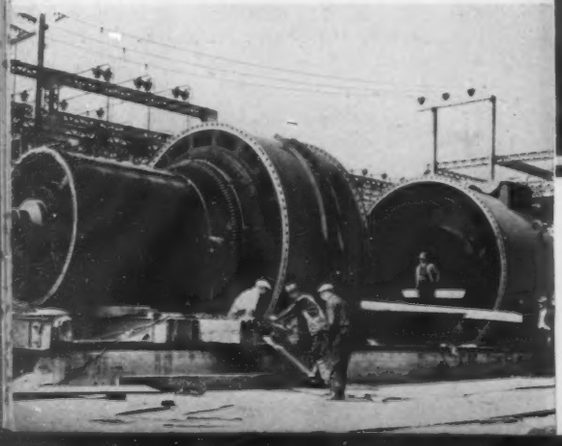
Receiving End autotransformer banks (right) are connected on the high voltage side, directly to the transmission circuits. Each of the two incoming circuits has an individual transformer bank. At this point the receiving end voltage of 275-kv. is reduced to 132-kv. These transformers are rated for 48,750 kw. without blowers, 65,000 kw. continuous with blowers and 80,000 kw. for 2 hours with blowers. Each bank, therefore, can carry 240,000 kw. for emergency periods, this being the combined capacity of the four main generating units connected to the transmission system at Boulder power house. Built by Westinghouse, these units are the largest auto transformers ever constructed, weighing 332,000 lb. and requiring an installation space 23½ x 36 x 11½ ft. Continuity of service being important, these units are protected on the primary side by 275-kv. autovalve lightning arrestors.



Power from the 132-kv. bus is further reduced in voltage by four banks of transformers, one of which is shown above. These units are forced air cooled and have three windings, the primary rated at 60,000 kva. and 132 kv. star; the secondary rated 80,000 kva. at 34.5 kv. star; and the tertiary rated 60,000 kva. at 13.2 kv. delta, the latter providing the connection for the 60,000 kva. synchronous condensers installed for voltage regulation of the line.



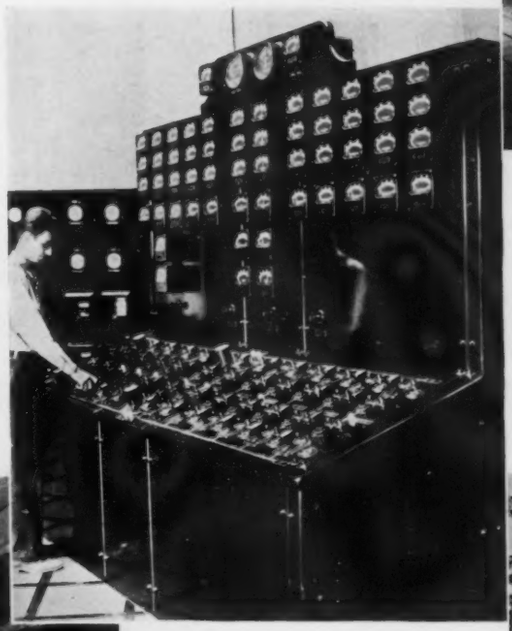
Lowering the core into the tank of one of the 275/132-kv. transformers. A special gantry crane, one of the largest in the world, was built at Receiving Station "B" to handle this equipment.



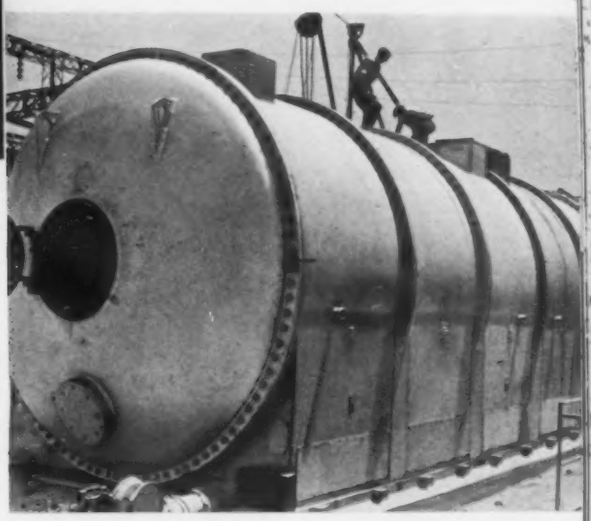
Four Synchronous Condensers, each rated 60,000 kva. leading, 36,000 kva. lagging are installed at the receiving station and connected to the system through the tertiary windings of the 132/34.5 kva. transformer banks. Condensers are hydrogen-cooled, outdoor type, manufactured by the General Electric Co. 13.2 kv. connections are made to transformers on tubular copper busses installed in a tunnel under the station. Auxiliaries are installed in a condenser pit directly below the machine.

STATIONS

Control Room of Receiving Station "B" in Los Angeles. Here, not only the switching for the receiving end of the Boulder circuits but also the control of the 132-kv. switchrack and incoming circuits from existing plants and the control of outgoing 34.5 kv. distribution feeders, is centralized. Left—A close-up of the bench type control board for the Boulder Power circuits.

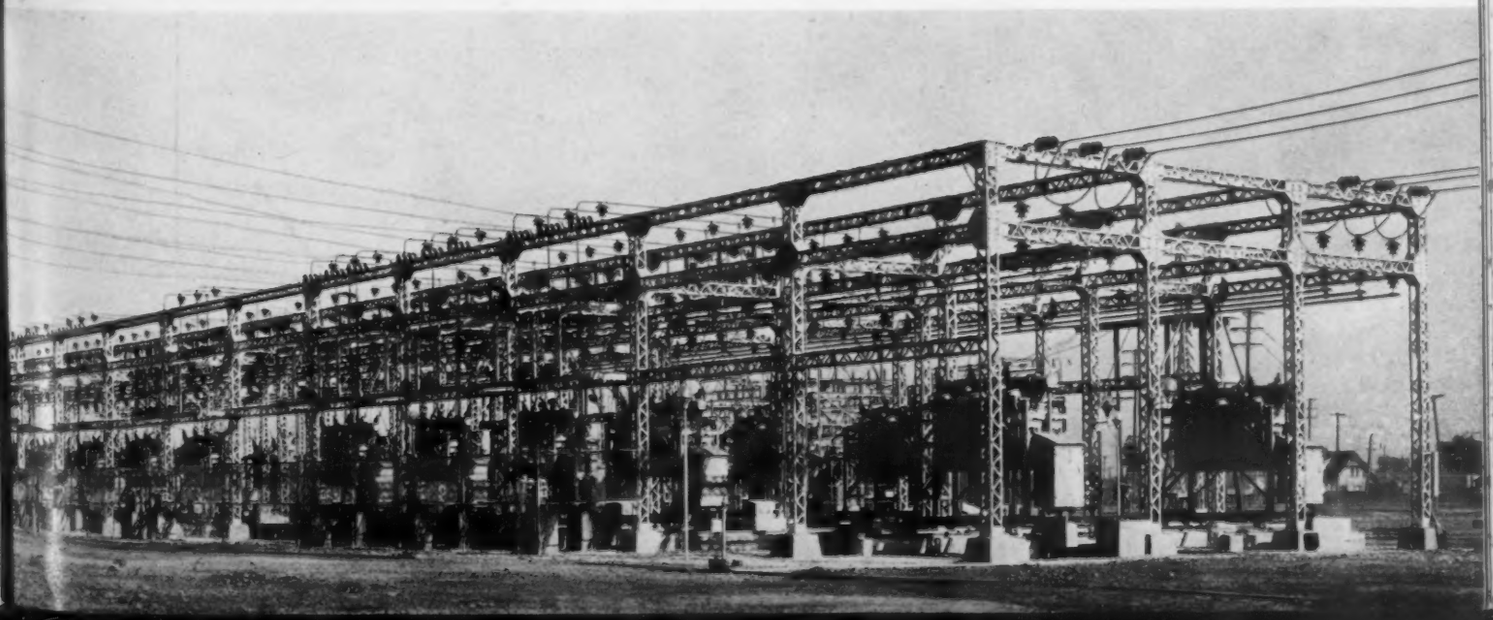


Cable Tunnel under the receiving station showing the method of supporting the multi-conductor, lead-covered control cables in their runs to various points. A relay board is shown at the left.



Frequency Changer, rated at 60,000 kva., is installed at Receiving Station "C" as a standby source of power. Normally this unit operates as a synchronous condenser, but, in emergencies, can be switched over quickly as a frequency changer taking 50-cycle power from the Southern California Edison Co., Ltd., and delivering 60-cycle energy into the Bureau's system which is now being changed over to the latter frequency.

Typical 34.5 kv. double bus switchrack at a receiving station. Each receiving station is designed for an ultimate of four of these 10-feeder switchracks supplied from the 132-kv. station bus through step-down transformers.



PERSONALITIES OF THE PROJECT

Officials of the United States Bureau of Reclamation and the Six Companies, Inc., of San Francisco. (Above left) From left to right: N. S. Gallison, H. J. Lawler of the Six Companies; Walker Young, Construction Engineer for the USBR; C. A. Shea and E. O. Wattis of the Six Companies; Dr. Elwood Mead, Commissioner of the USBR at the time the project was started who died in office during its construction; F. T. Crowe, Supt. of the Six Companies operations; R. F. Walter, Chief Engineer of the USBR. Denver, Colo.; and W. A. Bechtel, executive of the Six Companies organization.

Informal photograph of the USBR's top executives in Boulder City. (Above right) Seated (left) Walker Young, Construction Engineer from the start of the project until 1935 when he was transferred to take charge of the huge Central Valley Project of California. Standing—John C. Page. Acting Commissioner of the United States Bureau of Reclamation, Washington, D. C. Seated (right) Ralph Lowry, who succeeded Mr. Young as Construction Engineer, having served as Field Engineer since the start of the project.

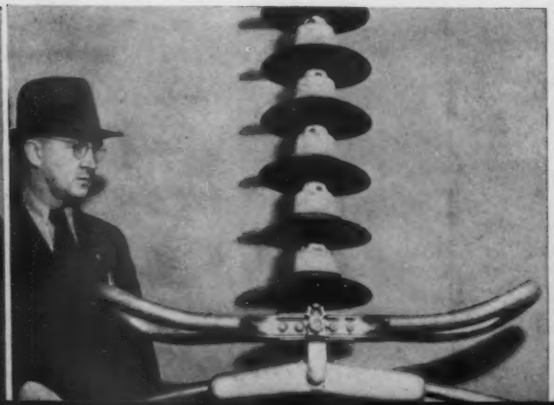
To A. C. Wingo (left center) of the Los Angeles Bureau of Power and Light, will fall the responsibility of the operation of Boulder power house. His title will be "Division Superintendent of Generation" with headquarters at Boulder City.

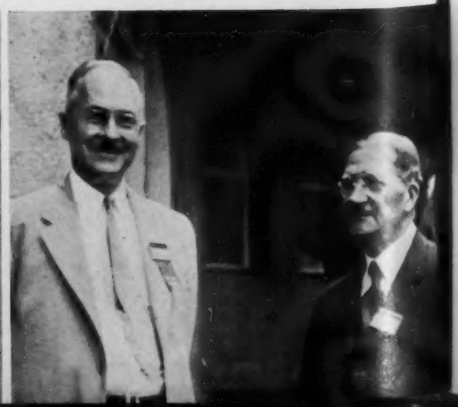
(Below right) Los Angeles Bureau of Power and light executives: (Left) C. P. Garman and (right) E. F. Scattergood, Chief Electrical Engineer and General Manager of the Bureau.

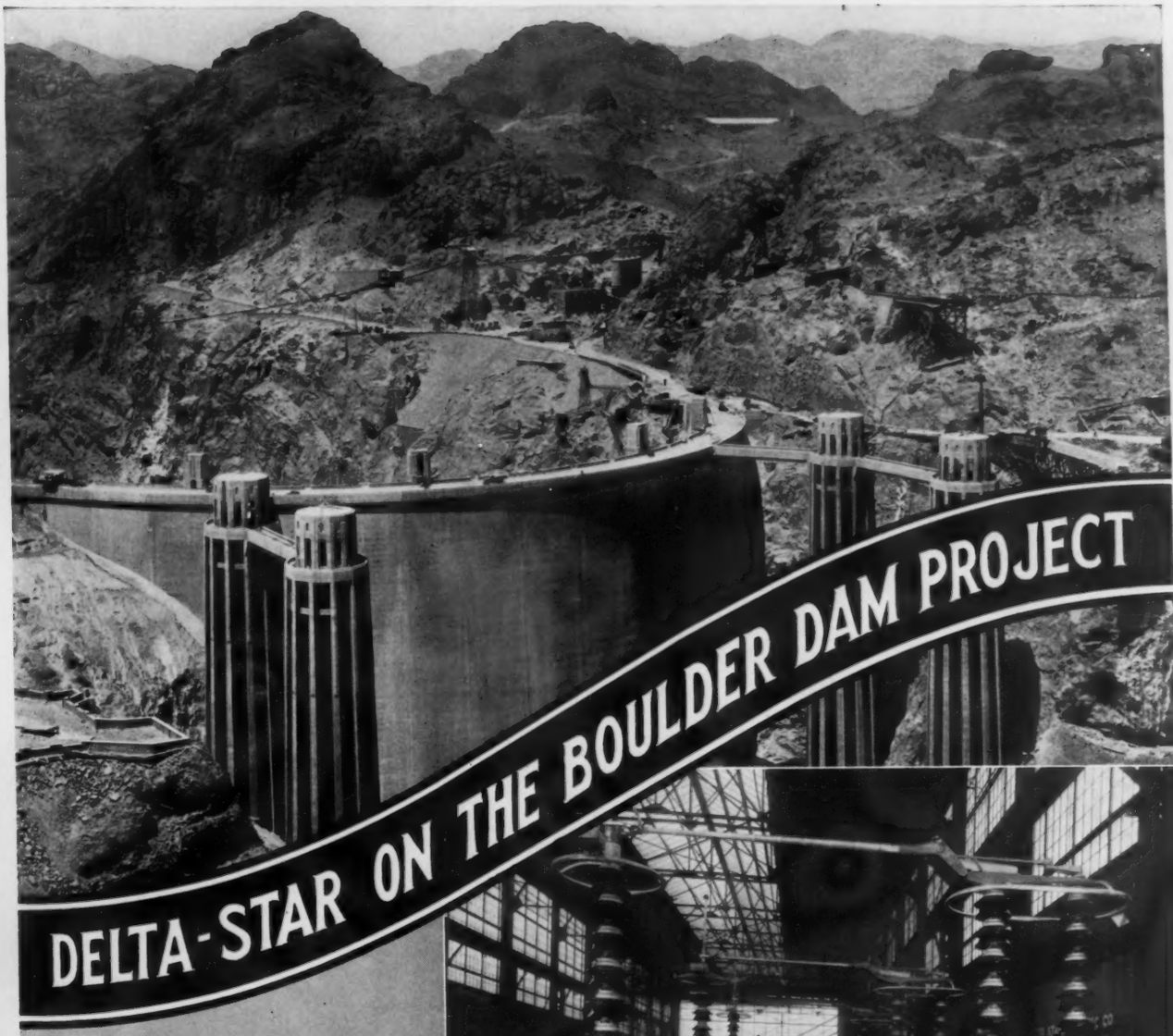
F. O. Bolser (below center), design engineer of the Los Angeles B. of P. & L., was responsible for many of the new developments required for the transmission system. Here he is shown with the special suspension clamp he designed for the Type HH cable used on the line.

H. C. Gardett (right center) head of the Bureau of Power and Light's Department of Design and Construction, under whose direction the pioneer 287-kv development was carried on.

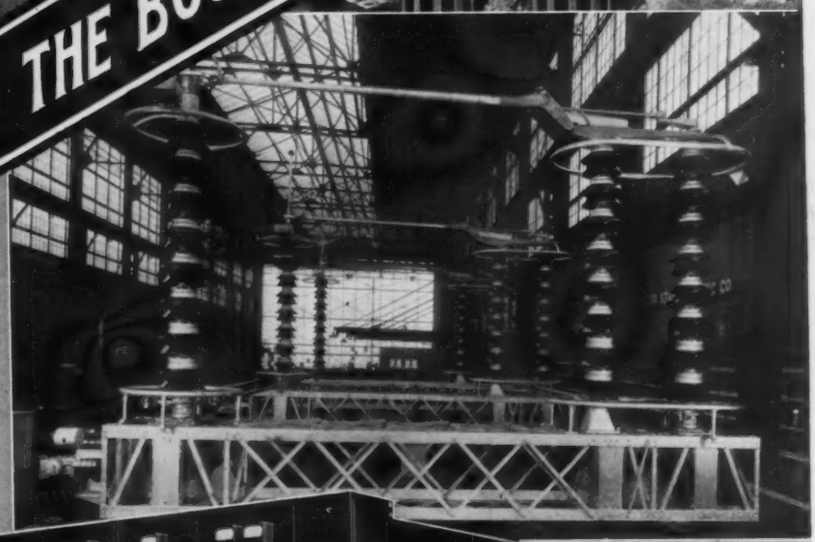
Left to right: H. J. McCracken, W. S. Peterson and Bradley Cozzens, Transmission Engineers of the L. A. Bureau of Power and Light (below left), whose research work contributed much to the advancement of the art of high voltage transmission.







DELTA-STAR ON THE BOULDER DAM PROJECT

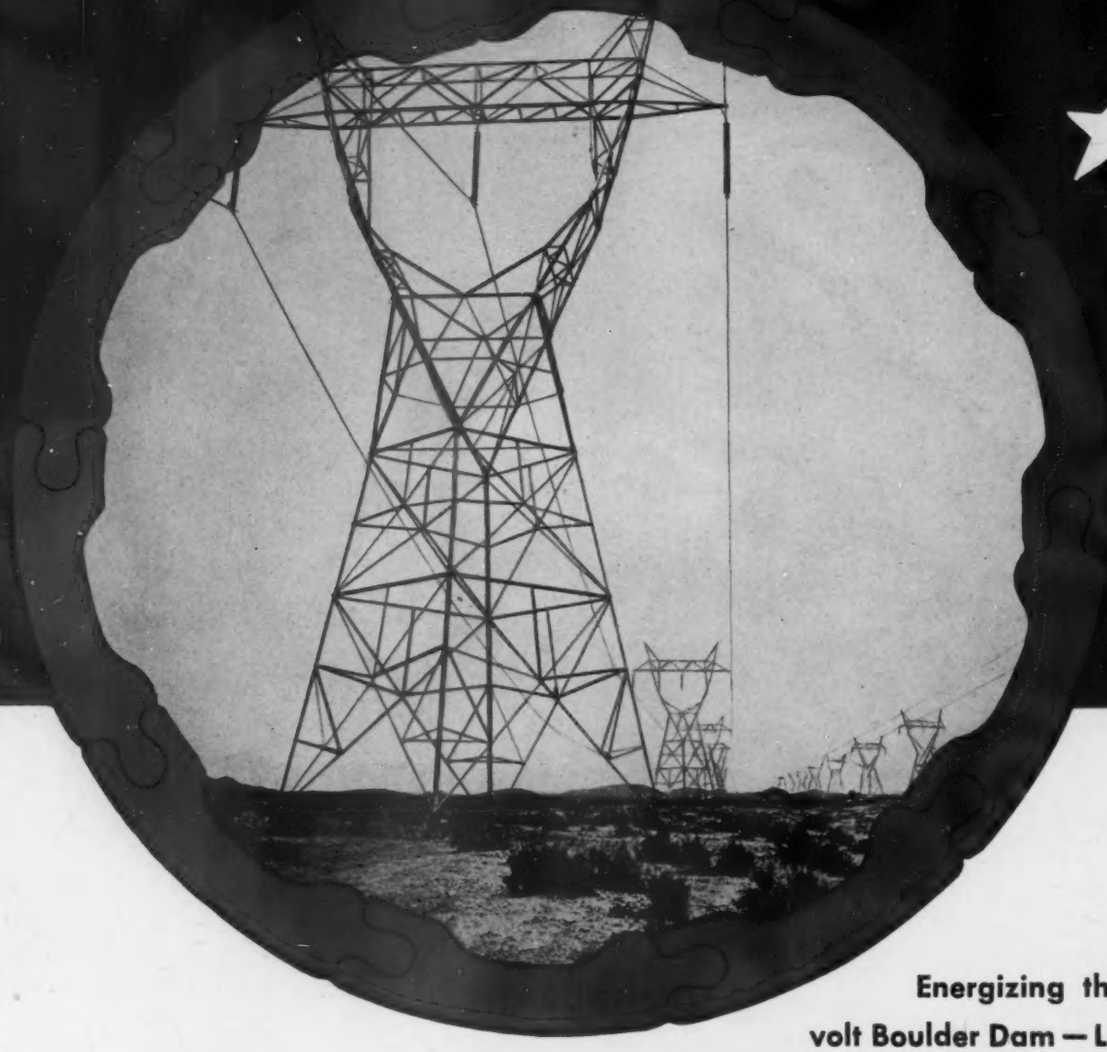


DELTA STAR ELECTRIC CO. CHICAGO ILLINOIS

One of sixteen 287 kv. motor operated disconnects on line to Los Angeles.

Metal-Clad switch gear for station auxiliaries in Power House

The Eyes of the Industry are upon it



Energizing the 287,000 volt Boulder Dam — Los Angeles line completes the outstanding achievement in power transmission . . . Never was a line more thoroughly engineered . . . Never was an overhead conductor given more searching preliminary tests of mechanical and electrical characteristics . . . Never were test results more conclusive . . . Type HH Cable was chosen to carry the load for the "8th Wonder of the World".

GENERAL CABLE CORPORATION

LOS ANGELES • SAN FRANCISCO • SEATTLE

GENERAL CABLE
TYPE HH
HOLLOW
CONDUCTOR

Conforms IN EVERY DETAIL TO THE **IDEAL SPECIFICATION** FOR A HIGH VOLTAGE CONDUCTOR

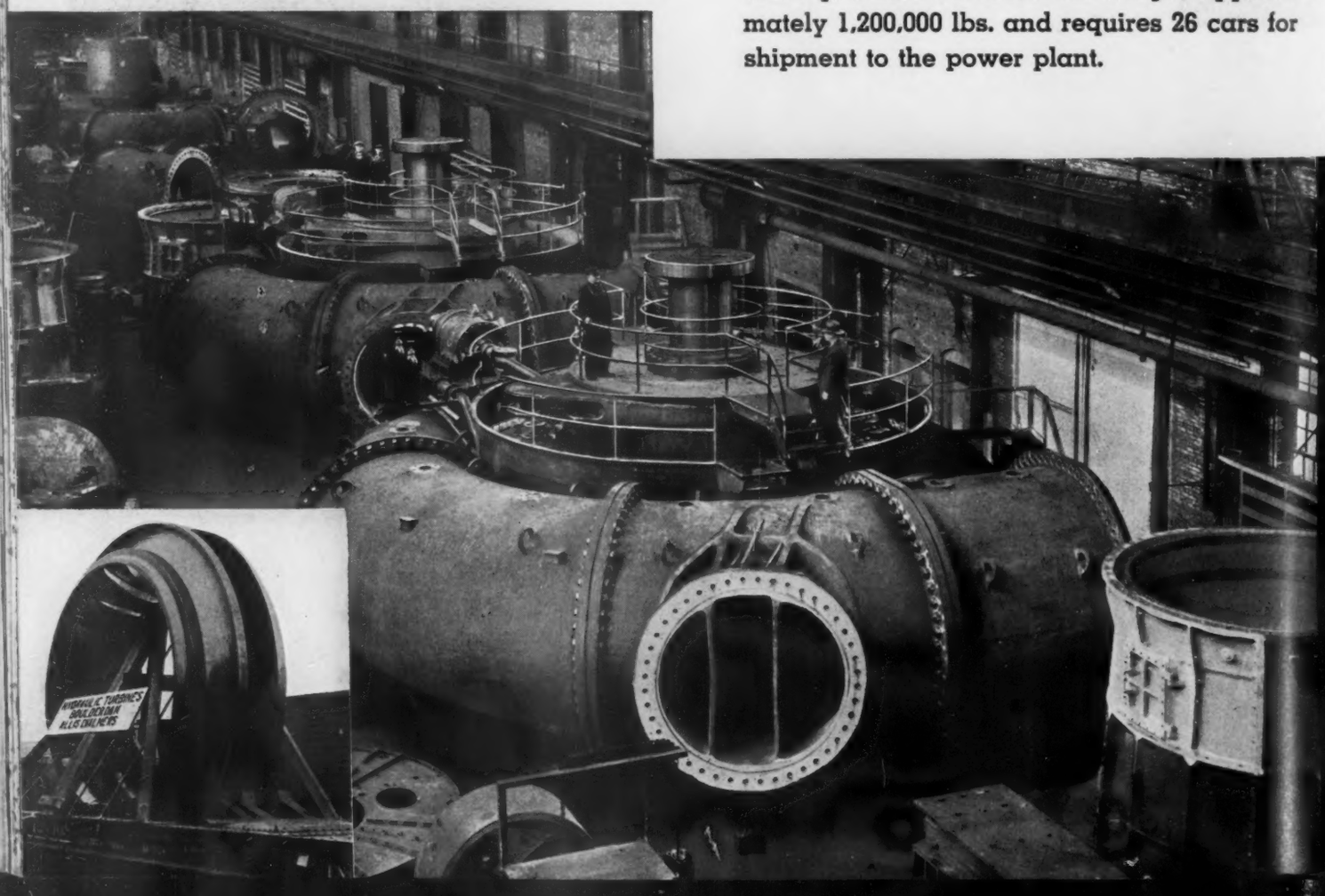
ALL COPPER CONSTRUCTION
100% EFFICIENT DIMENSIONS
SMOOTH SURFACE CONFIGURATION
MINIMUM CORONA LOSS . . . . . .
MAXIMUM WEIGHT SAVING . . . .
MINIMUM REACTANCE . . . . . .
INHERENTLY NON-VIBRATING
TIGHTLY INTERLOCKED SEGMENTS
SIMPLICITY OF FITTINGS . . . . . .
ECONOMICAL ERECTION . . . . . .

Epoch Making Equipment for Boulder Canyon Project

EVEN as the Boulder Canyon Development ranks as one of the outstanding engineering feats of the world, so also much of the equipment for the huge power plant establishes new world's records. The Allis-Chalmers Manufacturing Company is proud to have had an important part in the design and building of this equipment.

The four main turbines of the initial installation, for supplying power to the Bureau of Power & Light, City of Los Angeles, are rated 115,000 horse power each, and are the largest and most powerful ever built. Of the twelve metal-clad switchgear units for handling all the power from the generators, ten are the largest of their kind. The Company is also building the 40,000 kilowatt generator, supplying power for the Southern Sierra Power Company from the Boulder Canyon Power plant; also fourteen 20,000-kw. transformers for substations at the end of the transmission line in Los Angeles.

The four large turbines of the initial installation have a rated output of 115,000 hp. each at a head of 492.5 ft. and will operate at 180 rpm. They are of the vertical-shaft single-runner Francis type with cast-steel spiral casings and single piece cast-steel runners. At rated capacity each casing will carry about 2500 cu. ft. of water per second. Each unit weighs approximately 1,200,000 lbs. and requires 26 cars for shipment to the power plant.

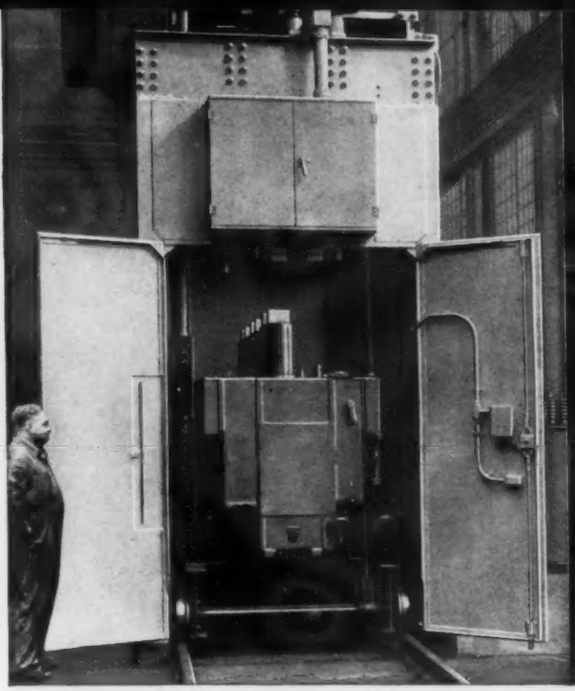


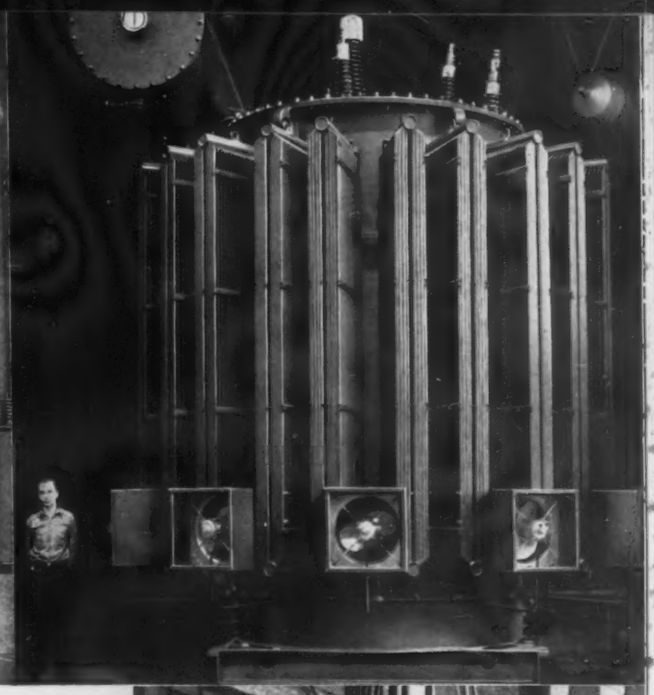
ON THIS PAGE

Right: 4000 amp, 23,000 volt, 2,500,000 kva interrupting capacity Switchgear Unit. 20,000 kva, 132,000 volt Transformer.

Lower right: 40,000 kw, 257 rpm, 13,800 volt Generator.

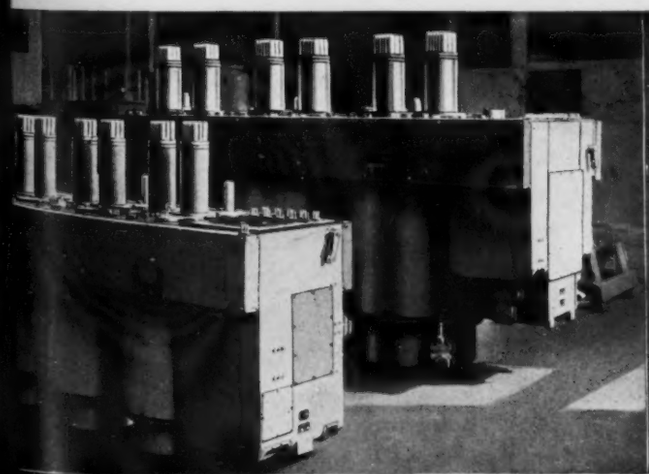
Below: Circuit Breakers for Switchgear Units.

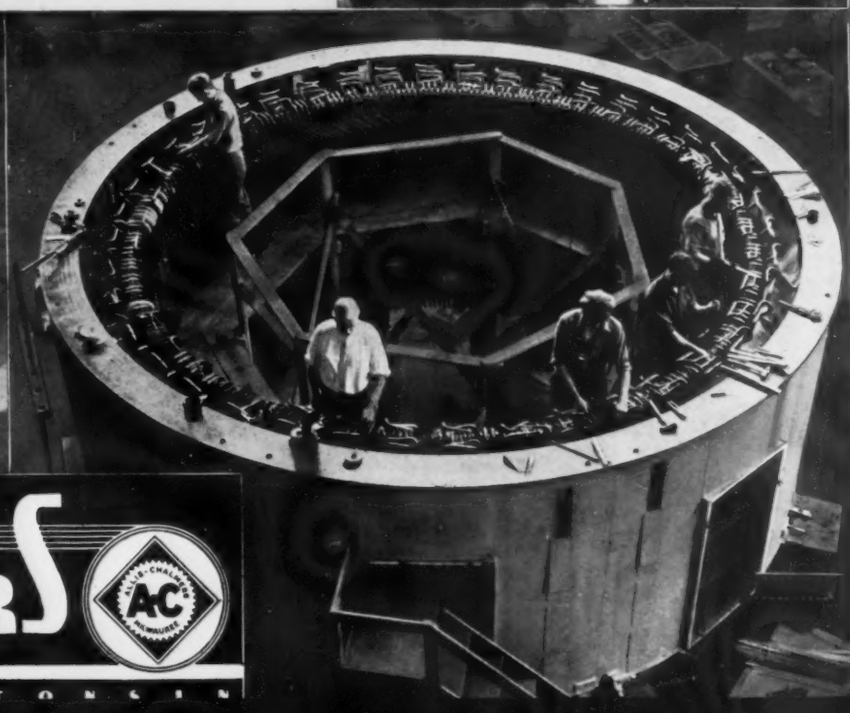




THE switchgear unit shown above is one of the ten 4,000 ampere units for controlling all the power, at generator voltage, of the generators now being built for the Boulder Dam power plant. These circuit breakers are the largest of their kind in the world, having to interrupt 2,500,000 kva. at 16,500 volts, and in addition to the oil circuit breakers, shown above, include buses, disconnects, etc. These factory-built units, complete with all mechanical and electrical interlocks, are totally enclosed, with every safety feature yet conceived for switching equipment. For use with automatic synchronizing, these large breakers have exceptionally high speed closing . . . only 26 cycles time from impulse to control until the breaker is closed; direct motor operated. The Allis-Chalmers Expulsion Port arc extinguishing principle is used for interruption. The overall operating time from the time the trip coil is energized to the time the circuit is interrupted is 8 cycles (60 cycle basis); arcing time is 2 cycles.

The 40,000 kva. generator built by Allis-Chalmers will operate at a speed of 257 rpm. The rotor construction is unique. It consists of welded plate steel sections mounted on a cast steel spider. The welded plate steel yoke is surrounded by an air housing connected with surface coolers through which cold water is circulated for removing heat from the circulating air. Before shipment the rotor will be tested at an overspeed of 455 rpm. in a special test pit. These generators will have unusually high stability, necessary because of the long transmission line.





ALLIS·CHALMERS

MILWAUKEE WISCONSIN

You'll See

at Boulder Dam

General Electric calls your attention to the G-E monogram on the electric equipment at Boulder Dam and on equipment of the City of Los Angeles, Bureau of Water and Power.

At Boulder Dam

Generators—Four 40-pole, 82,500-kva, 180-rpm, 16,500-volt generators with direct-connected main and pilot exciters, surface air coolers, and rheostatic-type generator-voltage regulators.

Transformers—Seven 60-cycle, 55,000-kva, 287,500Gr-Y, 16,320-volt transformers, and four 60-cycle, 13,333-kva, 138,000Gr-Y, 16,320-volt transformers.

Lightning Arresters—Four 287,500-volt, 3-phase Thyrite lightning arresters for complete suspension mounting. Two 138,000-volt, 3-phase, solidly grounded-neutral, Thyrite lightning arresters.

Reactors—Three cast-in-concrete, asbestos-insulated, indoor-type reactors, rated 462 kva, 560 volts, 825 amperes, with disconnecting switches.

Cableway—Motors, control, and other electric equipment for operation of giant 150-ton cableway.

Other Equipment—Motors and control for operation of butterfly valves and needle valves in penstocks and cylinder gate hoists in intake towers. Also power supply equipment for control of powerhouse clocks, vertical pump motors, ventilating fan motors, door and window controls, etc. During the construction period, G-E motors, control, and cable were widely used. G-E x-ray equipment, of 300,000-volt capacity, was used to explore 400,000 feet of welded seams in giant steel pipes.

For City of Los Angeles, Bureau of Water and Power

Oil Circuit Breakers—Eight 287,500-volt, 1200-ampere, 3pst, impulse breakers. Interrupting rating, 2,500,000 kva, 3 cycles. Four 138,000-volt, 1200-ampere, 3pst, impulse breakers. Interrupting rating, 2,500,000 kva, 3 cycles.

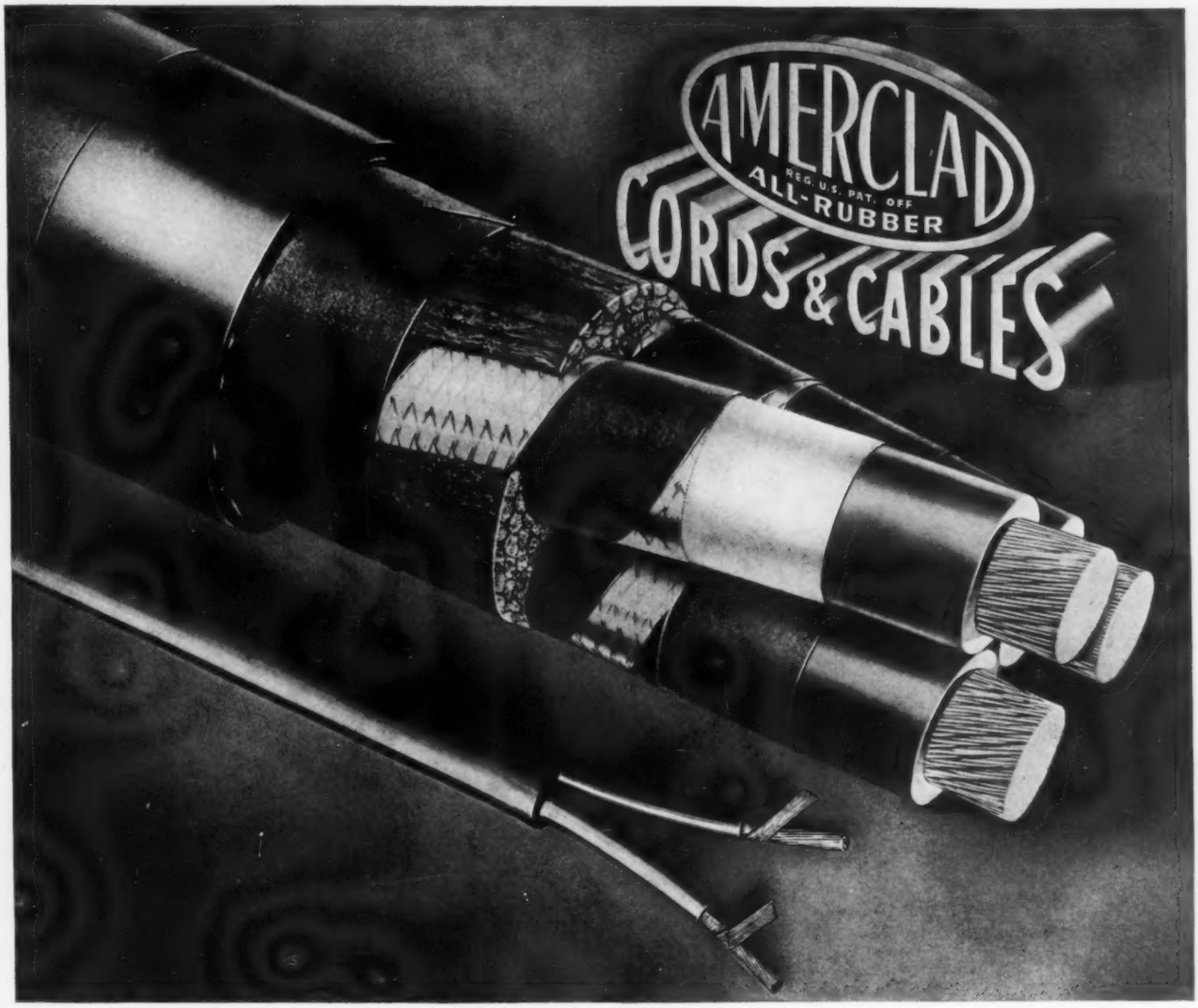
Synchronous Condensers—Two 12-pole, 50,000/60,000-kva, leading, 30,000/36,000-kva, lagging, 500/600-rpm, 50/60-cycle synchronous condensers—hydrogen cooled. Also exciters, rheostatic voltage regulators, and switchgear.

Carrier Equipment—Complete carrier pilot relaying system for Boulder Dam—Los Angeles lines including 12 terminals of carrier pilot relaying complete with relays, carrier apparatus, and carrier line traps. Also all carrier-current coupling capacitors (36) for all carrier frequency applications, and all (32) coupling capacitor potential devices.

96-316

GENERAL ELECTRIC

Brothers under the Skin



"BIG boy" or "little fellow"—Amerclad All-Rubber Cords and Cables are always dependable. Their make-up includes a jacket as tough as the hide of a rhinoceros—that fights off water, muck, acids, oils and grease. They're brothers under the skin.

While Amerclad Cords and Cables and their component parts have high tensile strength, toughness and marked resistance to abrasion, flexibility is in no way impaired. Such combinations are rare and explain our unprecedented performance records. After all, there is no substitute for over 100 years of wire making experience in equipping a cable to "take-it" in the roughest going.

Our complete range of Amerclad Cords and Cables will meet your requirements.

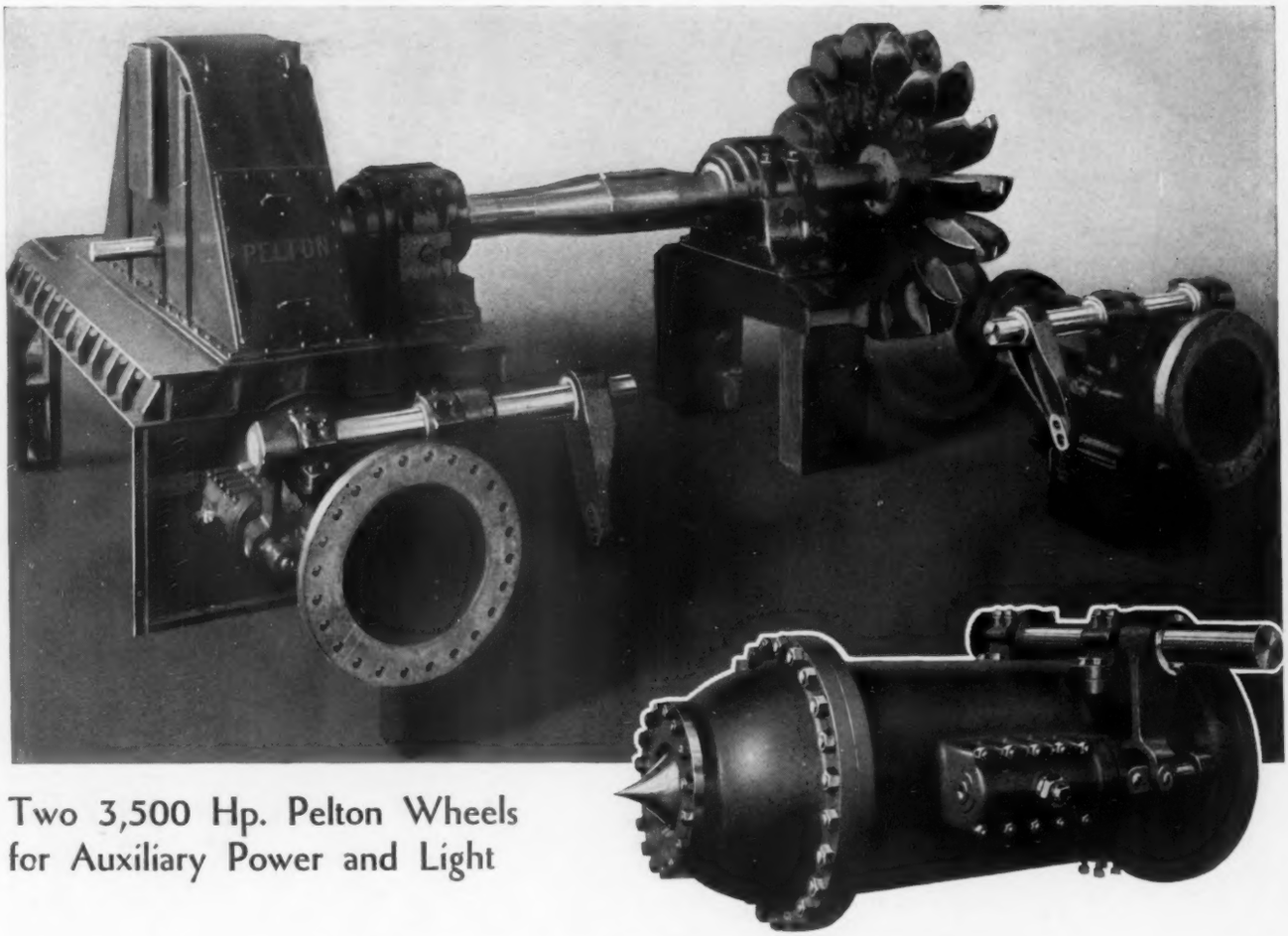
COLUMBIA STEEL COMPANY · *San Francisco*

Pacific Coast Distributors of Electrical Sheets for Carnegie-Illinois Steel Corporation

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Service Units for Boulder Dam



Two 3,500 Hp. Pelton Wheels
for Auxiliary Power and Light

Small by comparison of size and output but no less important from a service standpoint, are the two 3500 Hp. Pelton impulse turbines installed at Boulder Dam to provide light and power for the entire development, including Boulder City. These units represent the latest advances in impulse turbine design, and fully comply with the rigid government requirements for this project. They feature straight flow nozzle construction, new type Pelton buckets and the latest improvements in auxiliary devices.

These complete plant service units were furnished in addition to Pelton engineering and manufacturing facilities used in construction of two 115,000 Hp. reaction turbines now being built.

THE PELTON WATER WHEEL COMPANY

HYDRAULIC ENGINEERS

120 Broadway	**2929 Nineteenth Street**	**Paschall Station**
New York	**San Francisco**	**Philadelphia**

Exclusive Western Representatives for Baldwin-Southwark Corp., De La Vergne Engine Co., Cramp Brass & Iron Foundries Co., Woodward Governor Co., and Automatic Valve Division, Chapman Valve Manufacturing Co.

PELTON

Roller-Smith at BOULDER DAM

ROLLER-SMITH supplied a large number of the 440 volt air circuit breakers at Boulder Dam.

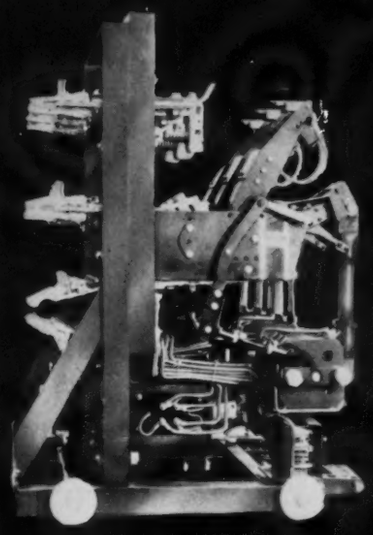
The illustrations show some of the individual withdrawal units and some of the complete cubicle type switchboards.

All the ROLLER-SMITH breakers at Boulder Dam incorporate the latest development in arcing structure, namely the use of metallic arcing tips instead of the conventional carbon arcing tips.

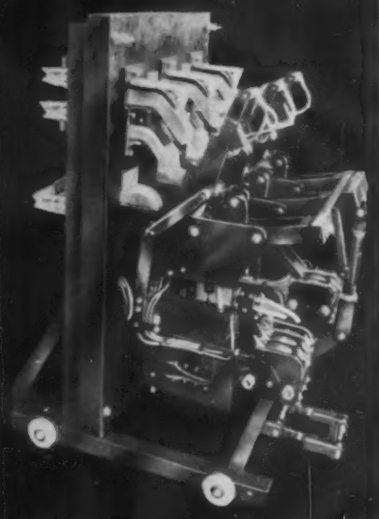
Exhaustive tests and long experience have demonstrated the high efficiency of the new metallic arcing arrangement.

Low Resistance
Not Fragile
Non-Volatile
Non-Welding

For further details see the ROLLER-SMITH advertisement in the August 29th issue of Electrical World and send for Supplement to Catalog P-5 and Catalog P-5, Section 3.



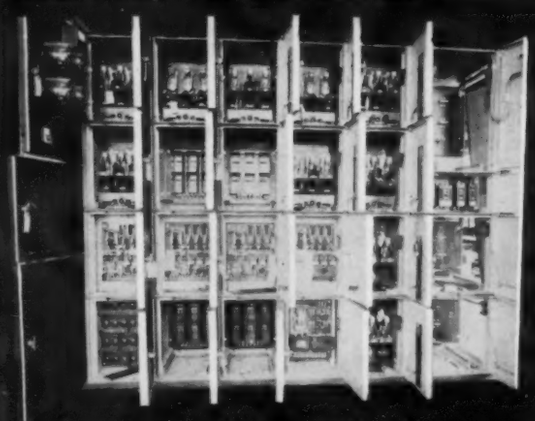
300 ampere, solenoid operated, Type BD air breaker withdrawal unit.



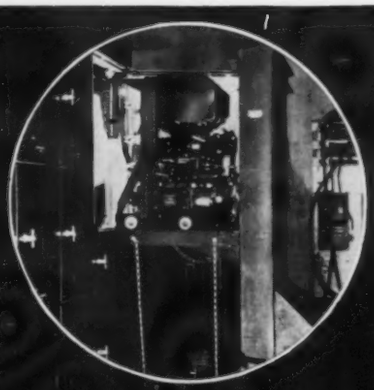
1200 ampere, solenoid operated Type HD air breaker withdrawal unit.

Solenoid operated air breaker withdrawal units.

Solenoid operated air breaker withdrawal uni



One of the main cubicle type switchboards with doors open.



Withdrawal unit being hoisted in place.

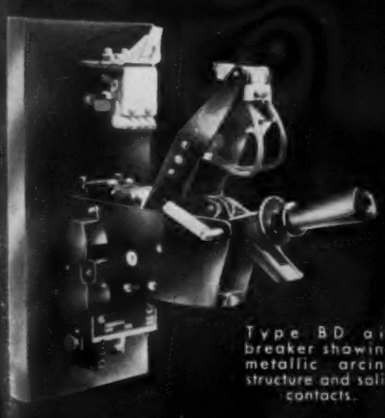
One of the main cubicle type switchboards with doors closed.

ROLLER-SMITH AIR BREAKERS

The Type BD is available in capacities of 600 amperes and less and the Type HD in capacities of 10,000 amperes and less.

Both Types have metallic arcing tips, are free-handle, manually or electrically operated, open or enclosed and are available in all styles of trips.

The line is MOST complete.



Type BD air breaker showing metallic arcing structure and solid contacts.

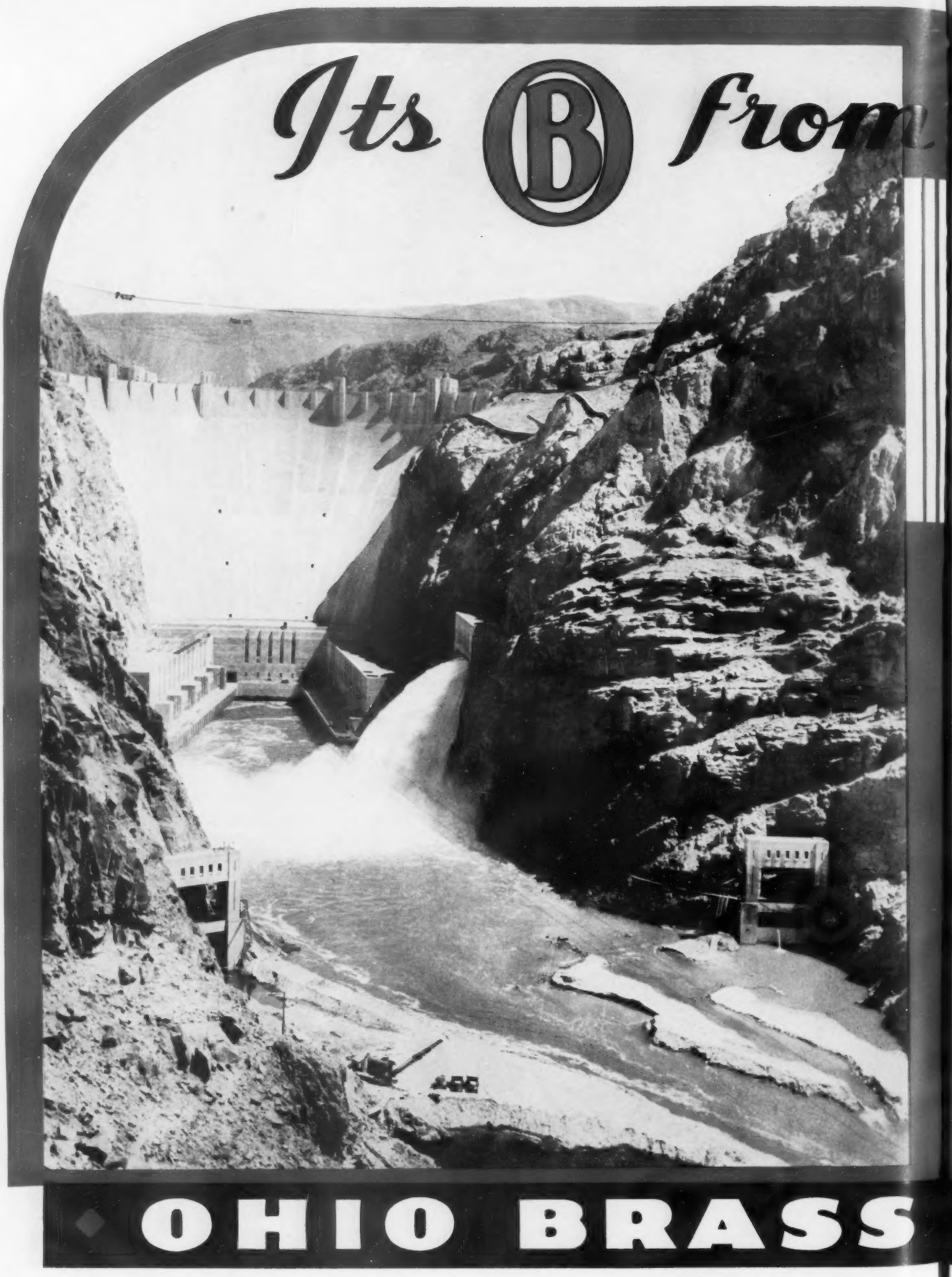
Type HD air breaker showing metallic arcing structure and laminated contacts.

ROLLER-SMITH COMPANY
Electrical Measuring and Protective Apparatus

MAIN OFFICE
30 Barclay St., NEW YORK

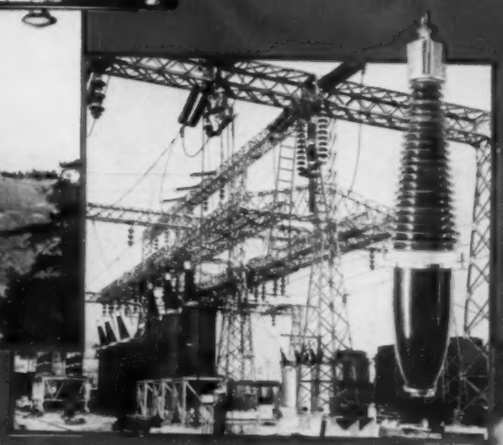
WORKS
Bethlehem, Pennsylvania

Sales Agencies in Principal Cities in United States and Canada

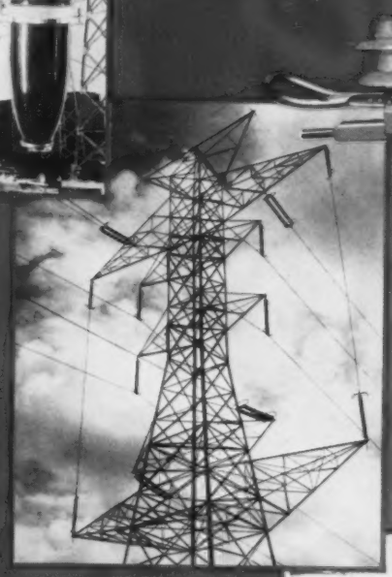

Its B from
OHIO BRASS

BOULDER DAM *to* L.A.

More than 250,000 O-B suspension insulators Nos. 25620 and 32947 are used to insulate the 287-kv. transmission line from Boulder Dam to Los Angeles. 24 units, No. 25620 are used at suspension points; and 22 units per string of No. 32947's are used in double yokes at dead-end points.



The apparatus bushings on circuit breakers and transformers of the 138-kv. belt-line substations which are supplied from the Boulder Dam transmission line, are all O-B oil-filled bushings of the "C" type. These bushings have the advantage of an all-porcelain main terminal insulation.



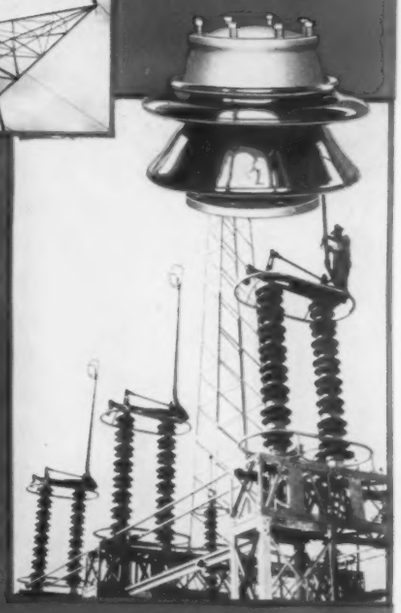
This is a part of the complete arc-protection device developed in the laboratories of the Ohio Brass Co. for use on the suspension strings of the 287-kv. Boulder Dam line. 3000 of these arcing devices are being installed on the line.

THE 287-kv. line, extending westward from Boulder Dam to Los Angeles, is insulated with more than 250,000 O-B suspension units.

In addition, the arcing devices on the suspension strings, the switch and bus insulators on the huge line-disconnect switches, and the apparatus bushings on transformers and circuit breakers in 138-kv. service, were also designed and manufactured by O-B.

The quality and performance of O-B materials are not unfamiliar to the builders of the Boulder Dam line. The Bureau of Power and Light of the city of Los Angeles has been a consistent user of O-B materials for a good many years.

It is with worthy pride that O-B views the part its materials play in tapping this new reservoir of power which will add to the advancement of the Los Angeles area and to the comfort and well-being of its people.



To provide great rigidity and mechanical strength in the insulator stacks of the 287-kv. line-disconnect switches, O-B designed and manufactured the largest pillar insulators ever made. These are used as the first two bottom units. They are 14½ ins. high and 19½ ins. in diameter and have a 10 in. diameter bolt circle.

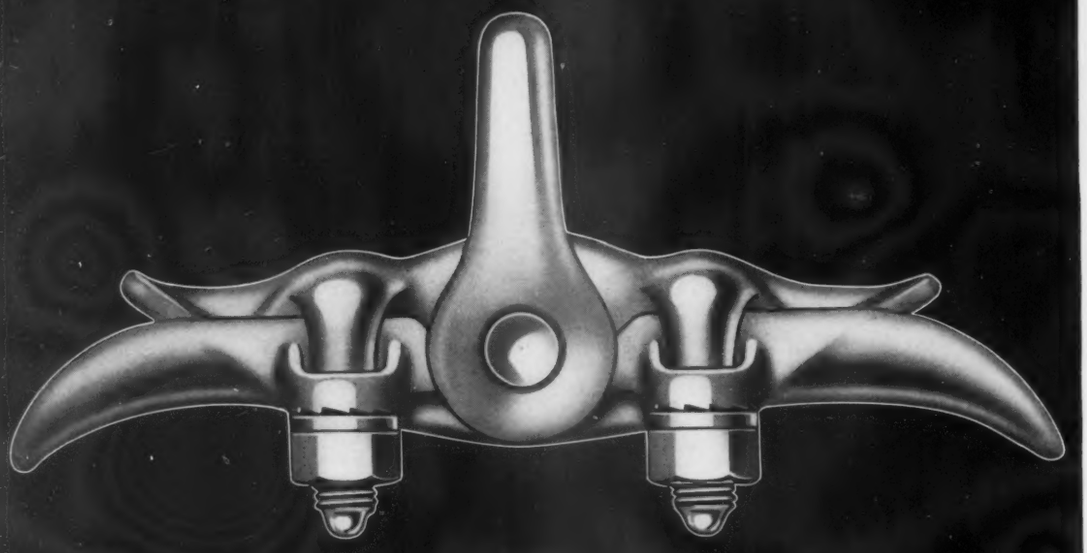
1879H

OHIO BRASS COMPANY
MANSFIELD, OHIO, U. S. A.

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont., Can.

COMPANY

BTC

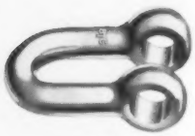


8200
GROUND
WIRE
CLAMP

Courtesy McGraw-Hill

3080

3020



3018

3082

We feel highly honored to have placed BTC high-line-hardware on as great a project as Boulder Dam and we wish to extend our appreciation to the engineers and insulator manufacturers responsible for their placement.

It is with pardonable pride that we point to our 8200 ground wire clamp in the small inset. Where reliability is required the engineer can always depend on the drop forging to take the brunt of the strain. They are uniform throughout.

The Brewer-Titchener Corp.

Supplied by your insulator manufacturer only

SINGLE-PHASE SIMPLICITY AND ECONOMY *brought to* POLYPHASE METERING

All of the many money-saving advantages which the CS Detachable Meter introduced to single-phase metering are now available for all two-element applications. An outstanding design achievement has made it possible to enclose polyphase meters in detachable single-phase housings without any sacrifice of conventional polyphase meter performance. Among the resulting economies, the following are outstanding:

1—With only minor changes in the wiring or the terminal arrangements in the sockets, detachable meters for the entire range of single-phase and two-element applications may be interchanged as required by changing load conditions and distribution systems.

2—The use of a cover and other parts which are produced in large quantities for single-phase meters, makes available a true polyphase meter at a much lower price.

3—Standard Westinghouse demand registers, demand contacts and other accessory devices are interchangeable in all Detachable single-phase and polyphase meters.

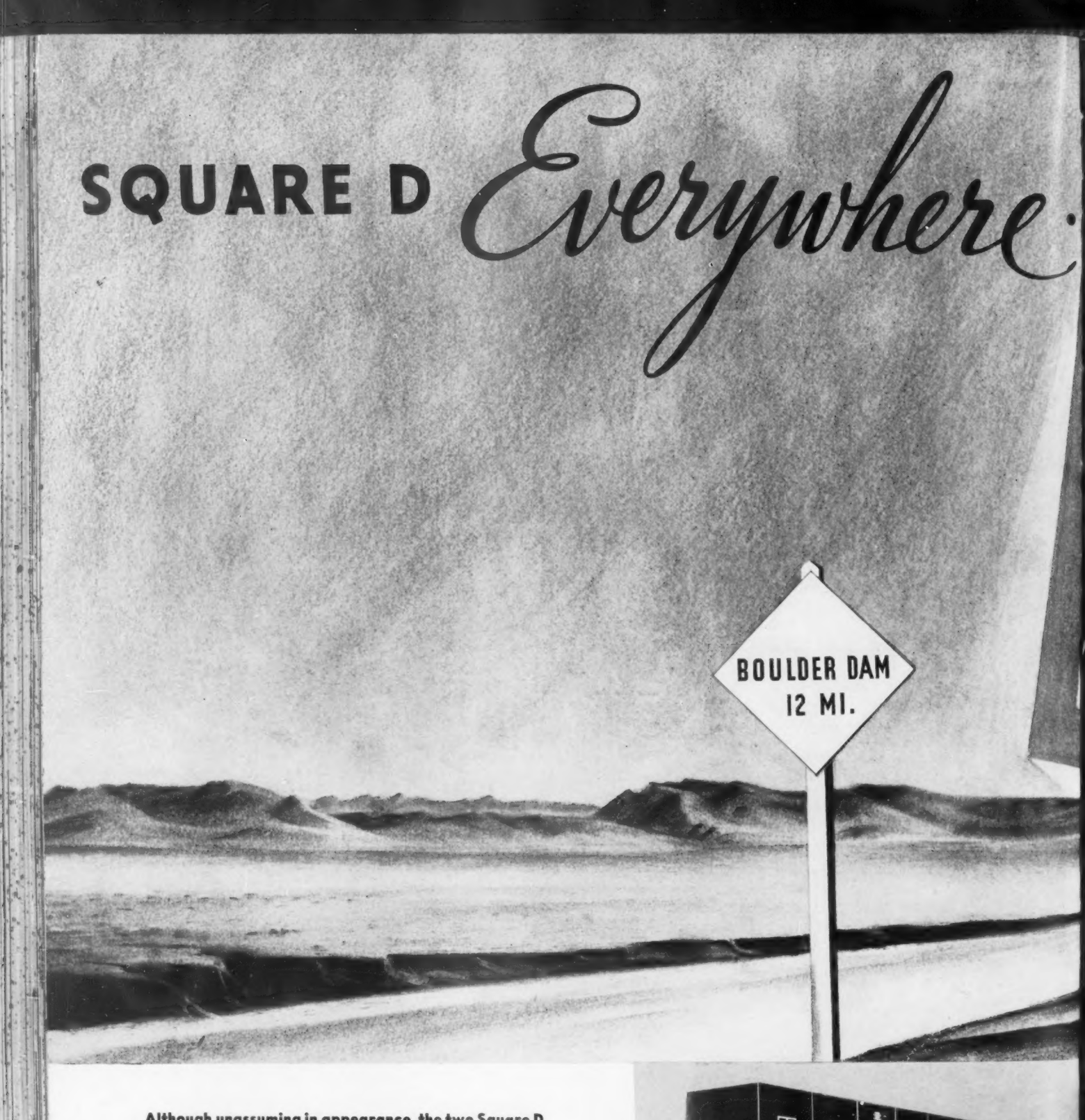
4—The simplified mounting and other Detachable features reduce materially installation and maintenance costs.

These are only a few of the outstanding advantages which distinguish the new Westinghouse polyphase meters. For more detailed information and performance curves, ask for Catalog Section 42-210. Address Room 5-N, East Pittsburgh, Pa. J 40049

QUALITY — WESTINGHOUSE — 1886 — 1936 — GOLDEN JUBILEE — METERS — INSTRUMENTS — RELAYS

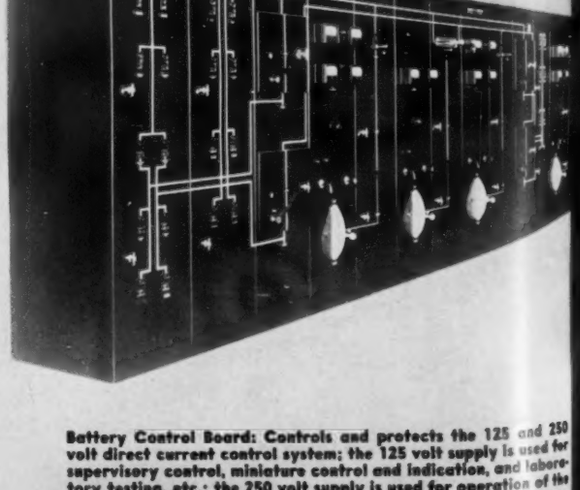
Westinghouse

SQUARE D *Everywhere.*



Although unassuming in appearance, the two Square D switch and panel boards at the right are, in reality, as dynamic in their particular function as the 1,280,000 kw. of power that Boulder Dam will generate. At the left is the Battery Control Board, containing local control for station storage battery charging equipment; at the right is the Water Control Board on which is the complete control and indication apparatus for all of Boulder's major hydraulic equipment. Here, at a glance, can be visualized finger-tip control of a great portion of this gigantic power project.

A L L I N A SQUARE D MAN



Battery Control Board: Controls and protects the 125 and 250 volt direct current control system; the 125 volt supply is used for supervisory control, miniature control and indication, and laboratory testing, etc.; the 250 volt supply is used for operation of the main generator, oil circuit breakers, governor equipment, emergency lighting, emergency turbine oil pumps, and similar circuits.

. . AND BOULDER DAM IS NO EXCEPTION

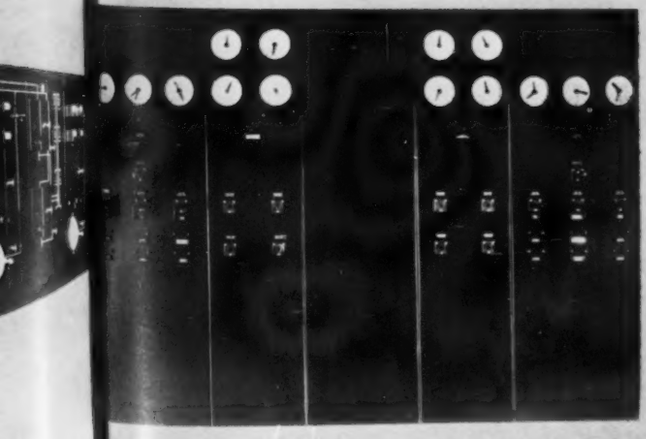
When horsepower is harnessed, the electrical industry counts on Square D for control.

At Boulder Dam, today's colossus of modern hydro-electric development, Square D switch and panel boards stand as guardians in the manufacture of its electrical energy.

Throughout the West, — at Grand Coulee, at Bonneville, — wherever veritable Niagaras of power are being bridled, utility and government electrical engineers accept with confidence the installation of Square D equipment.

And there's a reason. Square D is a symbol for electrical control, perfectly applied. The name vouches for correct design, sound engineering, precise workmanship and trouble-free operation.

Square D Everywhere is more than a slogan,—it's a theme that tells a story of universal application of modern control equipment by the users of electricity the country over.



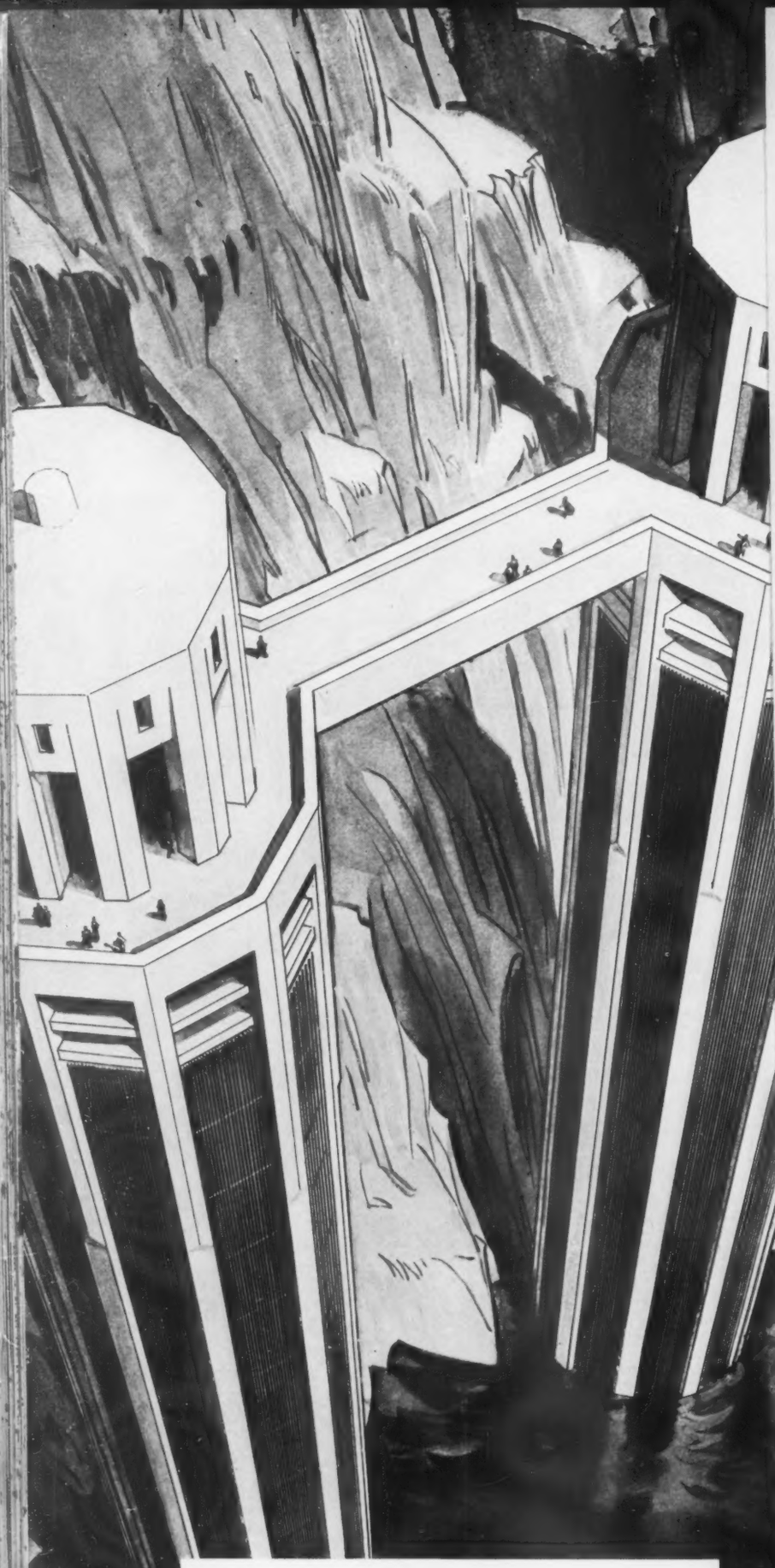
Water Control Board: Control and indication apparatus for hydraulic equipment including butterfly valves controlling flow of water to the main turbines, the cylinder gates controlling flow of water into the main penstocks and the needle valves controlling discharge of spill water into the Colorado River below the plant.

SQUARE D COMPANY

LOS ANGELES - DETROIT - MILWAUKEE

SQUARE D COMPANY CANADA LTD TORONTO, ONTARIO

CALL IN A SQUARE D MAN



Two huge gates are located in each of the four intake towers, each gate a massive cylinder 32 feet in diameter, eight feet high and weighing 240 tons. Made entirely of welded plates requiring 530,500 linear inches of weld . . . and then, because of their enormous size, shipped in segments which in turn were welded together at the dam . . . these eight gates comprise the largest arc welding job of its type ever completed.

VITAL LI

in a Mighty C

Out of the mighty resources of a nation has been forged a mighty chain! Reaching from the site of Boulder Dam to the city of Los Angeles, 270 miles away, it bears the energy of a million horsepower in the form of useful electric current, for the doing of man's work . . . in Industry, in Commerce, and in thousands of Homes.

Vital links in this powerful chain are the electrical equipment, apparatus and service auxiliaries *built by Westinghouse*—

At Boulder Dam:

- 82,500 kv-a. Water Wheel Generators
- 1,000 kv-a. Power Transformers
- 287,500 volt "De-ion" Grid Oil Circuit Breakers
- 55,000 kv-a. Power Transformers
- Lightning Arresters and Capacitors for generator protection
- Current Limiting Reactors
- 15 kv. Breakers for generator neutrals
- High-potential Test Set
- Miniature-type Switchboards
- Portable Instruments
- Lighting Equipment
- Welding Sets

At Los Angeles:

- 65,000 kv-a. Power Transformers
- 15 kv. Oil Circuit Breakers
- High-voltage Lightning Arresters
- World's largest hydrogen-cooled Frequency Changer
- Carrier Current Relaying
- Supervisory Control

★

50 YEARS OF GROWTH AND ACHIEVEMENT

★

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LINKS

ty Chain.....

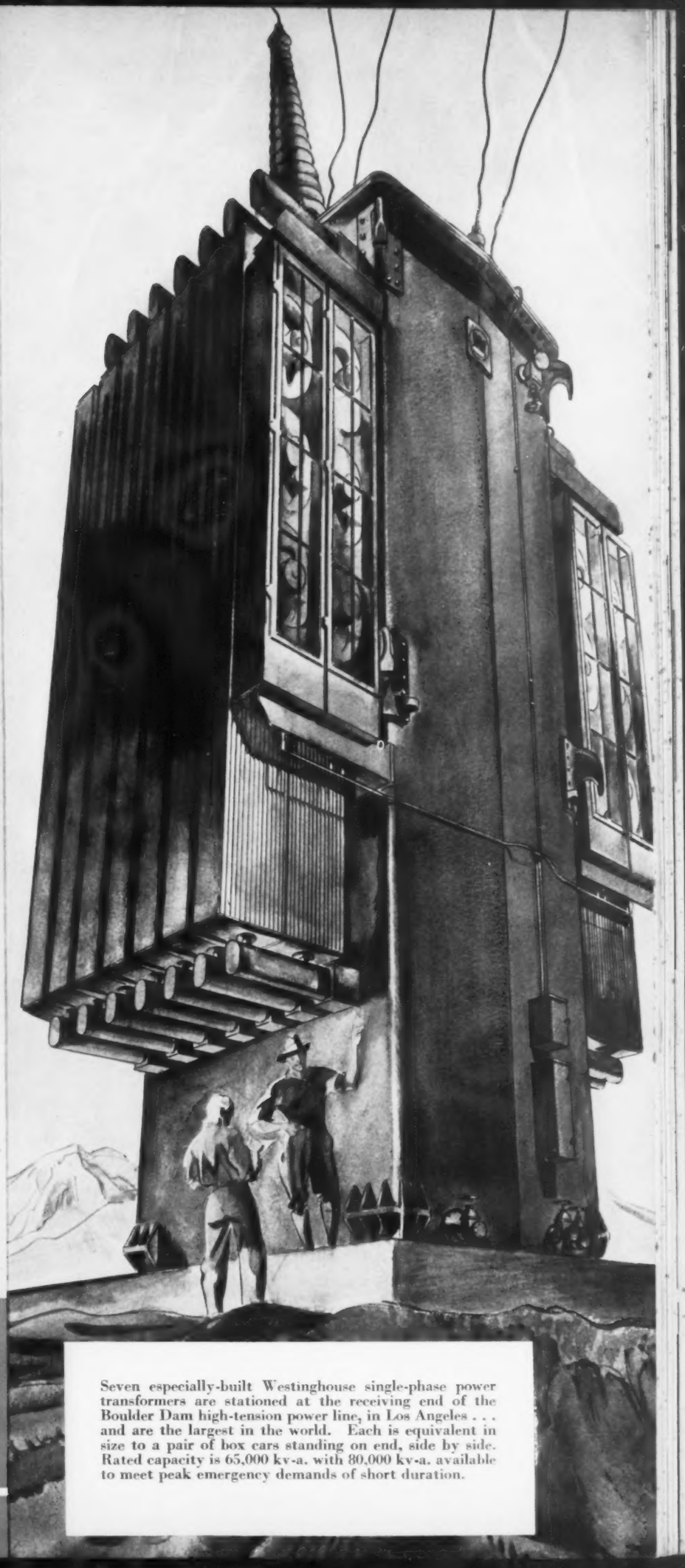
From the very inception of this monumental construction project, Westinghouse equipment appeared in an important role.

Building of the Dam and Power House proceeded by night under Westinghouse floodlighting. Westinghouse motors and control were used to operate construction equipment such as shovels and drag lines, compressors, gravel plants, cableways, and pumps to circulate water for cooling the huge masses of concrete; cement blending and mixing plant, locomotives and mucking machines. Westinghouse motors also powered the compressors for air conditioning equipment which converted desert heat into living comfort in workmen's dormitories, and Westinghouse Welders transformed segments of steel into the mammoth gates that control the flow of water through the intake towers.

In this, its Golden Jubilee year, Westinghouse is proud to have played a significant part in the great Boulder Dam enterprise . . . a part made possible by 50 years of fruitful experience in every field of electrical service. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pennsylvania. J 91181

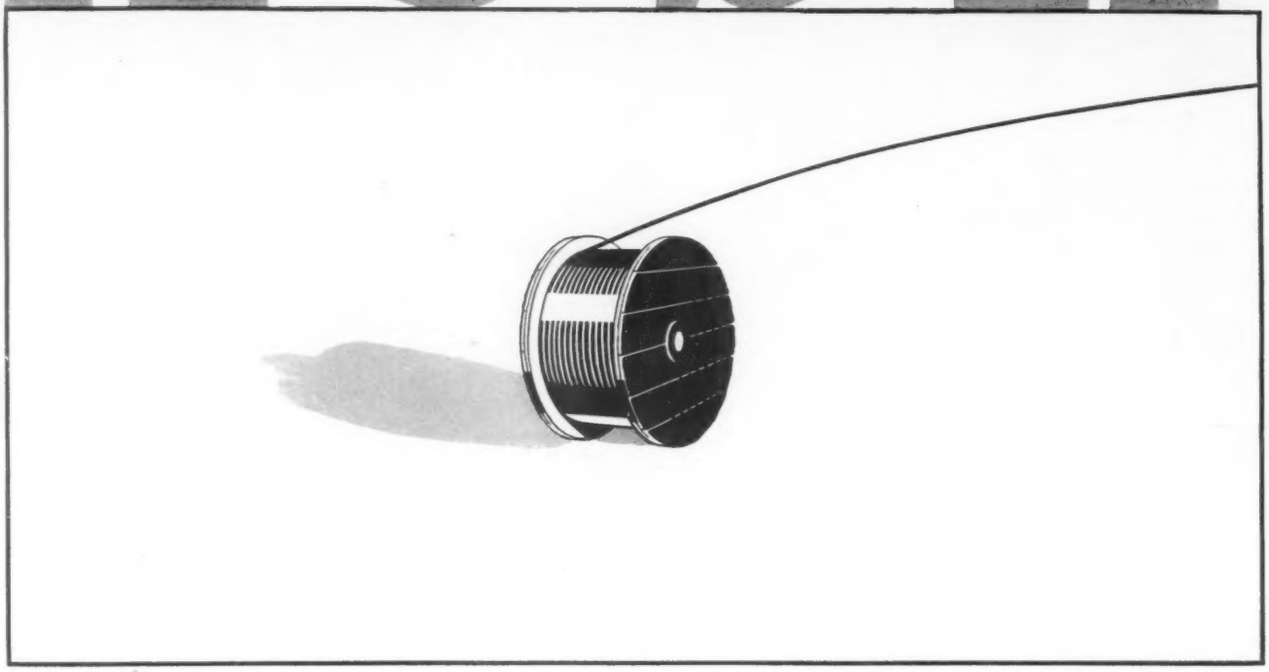
Westinghouse

WESTINGHOUSE 1886 W 1936 GOLDEN JUBILEE



Seven especially-built Westinghouse single-phase power transformers are stationed at the receiving end of the Boulder Dam high-tension power line, in Los Angeles . . . and are the largest in the world. Each is equivalent in size to a pair of box cars standing on end, side by side. Rated capacity is 65,000 kv-a. with 80,000 kv-a. available to meet peak emergency demands of short duration.

A·C·S·R



★ ONE WORD EXPLAINS A·C·S·R ★

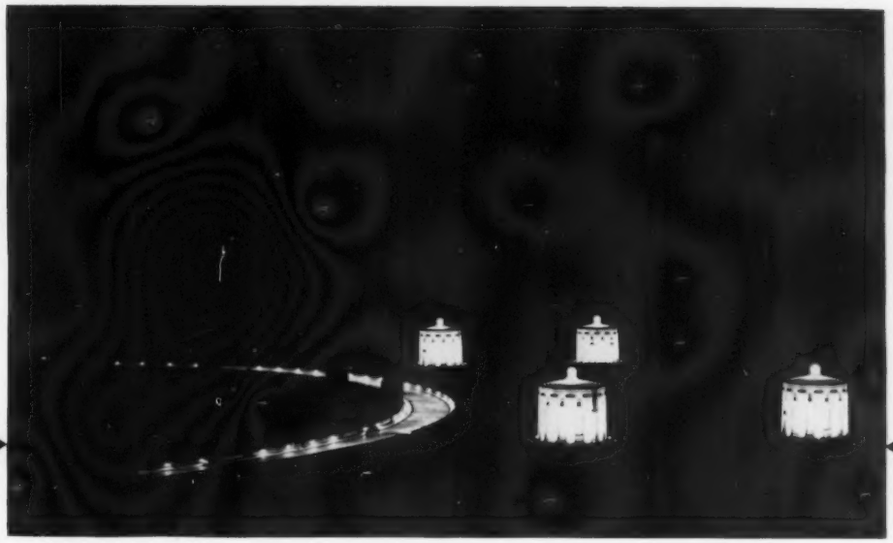
Translate A. C. S. R. into fundamental terms, and you have *economy*. In erection the better strength-weight ratio allows longer spans, easier handling.

When maintenance is considered, A. C. S. R's record of reliability on 430,000 miles of line is further recommendation. Flashovers are unlikely to be serious, because arcs on Aluminum are unstable, moving over the surface instead of burning deep, and the steel core, which comprises 50-60% of the strength, is always protected by Aluminum strands.

To aid you in realizing these advantages, a complete engineering service stands behind A. C. S. R., to co-operate with members of the industry in making plans and checking applications. Under the sponsorship of this service, for example, was developed the technique of vibration control by the use of Armor Rods and the Stockbridge Damper.

When you want up-to-the-minute data on conductors, or help in attacking an individual transmission problem, remember that it is gladly furnished by the makers of A. C. S. R. ALUMINUM COMPANY OF AMERICA, 2132 Gulf Building, Pittsburgh, Pennsylvania.

ALUMINUM COMPANY OF AMERICA



CROUSE-HINDS
VIADUCT LIGHTING UNITS AND FLOODLIGHTS
create a night effect of grandeur and power at
BOULDER DAM

The newest and best form of roadway lighting for dams, bridges and viaducts was chosen for lighting the roadway across Boulder Dam. Crouse-Hinds type VCD-12 and VCD-6 roadway lighting units light these areas to a high intensity of effective vertical illumination without glare.

The exteriors of the intake towers are floodlighted evenly and efficiently by special Crouse-Hinds type ADE-14 floodlights built into the balustrades.

Information about the application of these new forms of lighting will be furnished on request.

Type VCD-12

Type ADE-14

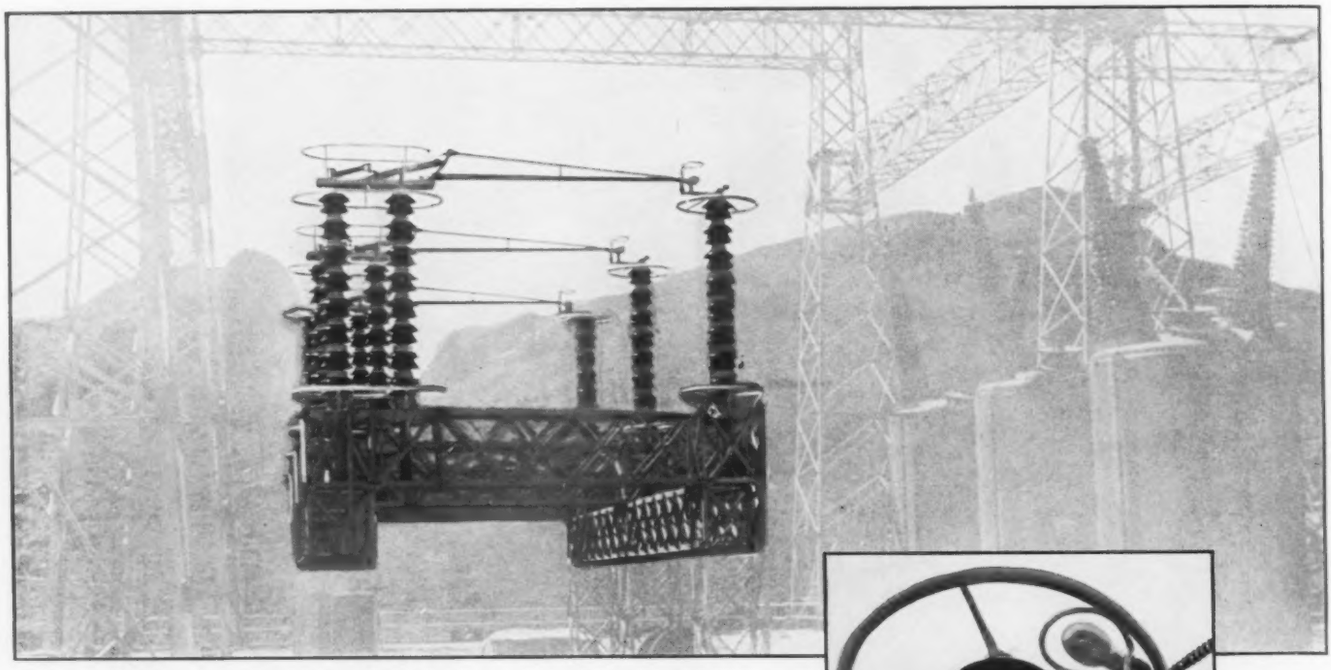
CH 604

CROUSE-HINDS COMPANY

ESTABLISHED 1897

SYRACUSE, N. Y., U. S. A.

Every 287-Kv. Disconnecting Switch at Boulder Dam *Built by BOWIE*



FOUR REASONS WHY IT PAYS TO INSTALL BOWIE AIR-BREAK SWITCHES

1. Heavy, pure sheet silver, welded to blade and clip.

2. High pressure applied after blade movement has ceased.

3. Large contact area between blade and clip

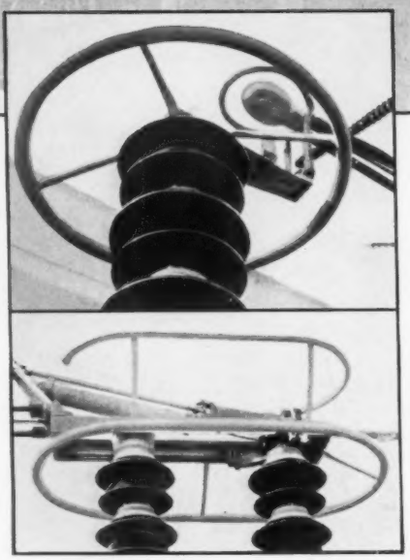
4. Precision anti-friction bearings used throughout.

BOWIE SWITCH CO.

Established 1906

815 TENNESSEE ST. SAN FRANCISCO, CAL.

Write for bulletins on Bowie standard switches and also brochure on switches installed at Boulder Dam.



TOP—One of twelve 287-kv. Bowie disconnecting switches installed in the Boulder Dam switch yard located on the Nevada side of Colorado River Canyon. The positive action of Bowie switches even under adverse conditions means greater efficiency, economy and protection of Boulder Dam power.

CENTER—Close-up of the clip end of the blade showing aluminum sleet-hood with swinging doors protecting the contacts, thus insuring against corona formation, freezing, corrosion.

BOTTOM—Hinge end showing switch blade always under positive control during 7 seconds from fully-open to tightly-closed position. Bowie switches function perfectly.

Look at LIFETIME COST

WHEN PURCHASING REGULATORS

FIRST cost, while important, is not the only factor to be considered when purchasing feeder voltage regulators. Far more important is the lifetime expense—the sum of first cost, installation, maintenance, inspection and replacement expenditures.

Westinghouse SS Induction Regulators for suburban and rural circuits have been designed for low *lifetime* cost. The initial expense of listed ratings is 30% to 40% less than that of a conventional station type regulator of the same capacity . . . installation costs are low because they can be pole mounted . . . minimum maintenance is required because there are no moving contacts to carry line current. The few moving parts are submerged in oil to eliminate wear . . . the current through the relay contacts is so small that their life is infinite. As a result only occasional inspection is required and maintenance is reduced to the minimum.

Get complete information today on the low *lifetime cost* regulator. Ask for Catalog 47-160. J 10020

WESTINGHOUSE 1886 W 1936 GOLDEN JUBILEE

Westinghouse

HUBBARD'S CONGRATULATIONS ON THE JOB DONE!

HUBBARD SERVICE WILL *SPEED* THE JOB AHEAD!

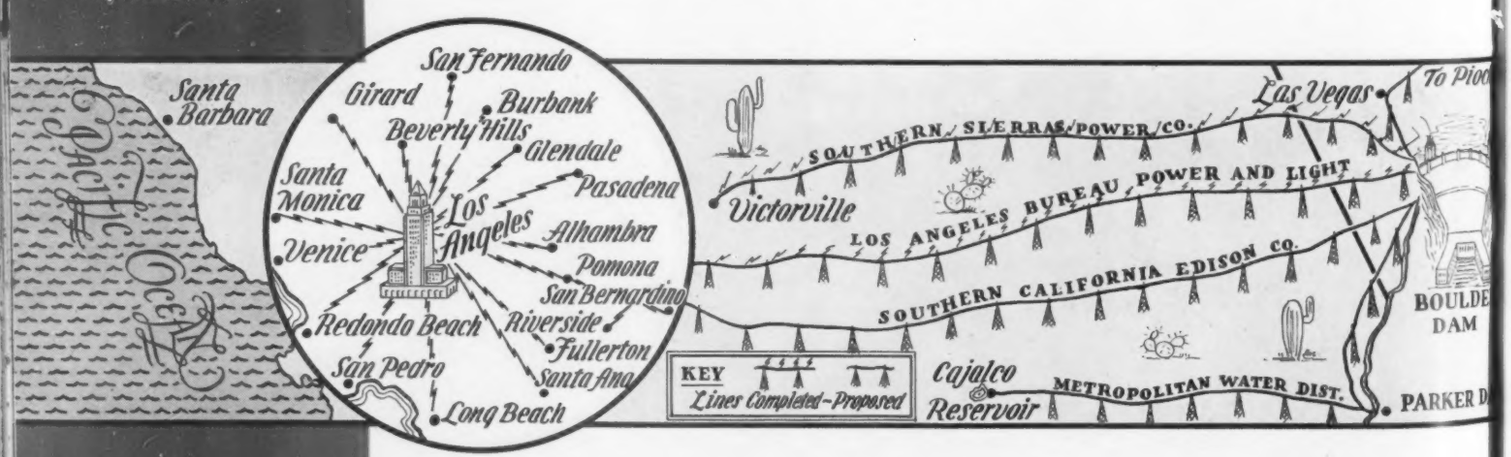
The building of Boulder Dam was a great achievement. Hubbard salutes the army of workmen, engineers and executives whose labors conquered this mighty source of electrical power for the West. Hubbard Hardware was used to distribute power for construction purposes at Boulder Dam and on the world's greatest transmission line from Boulder Dam to Los Angeles.

Economic distribution of this power to the ultimate user is now the problem confronting the engineers. The use of Hubbard Pole Line Hardware on these contemplated lines will assure greater continuity of service.

You'll save money by specifying Hubbard Pole Line Hardware and Peirce Construction Specialties. Their economy, dependability, and long life, even under severe conditions have been proven by leading utilities.

Complete stocks of Hubbard Pole Line Hardware and Peirce Construction Specialties are carried by the General Electric Supply Corporation and the Graybar Electric Company. Our Pacific Coast factory and staff of engineers are at your service to meet your special needs.

Hubbard Pole Line Hardware
•
Peirce Construction Specialties



THE HARDWARE MAKES THE LINE

HUBBARD MAKES THE HARDWARE

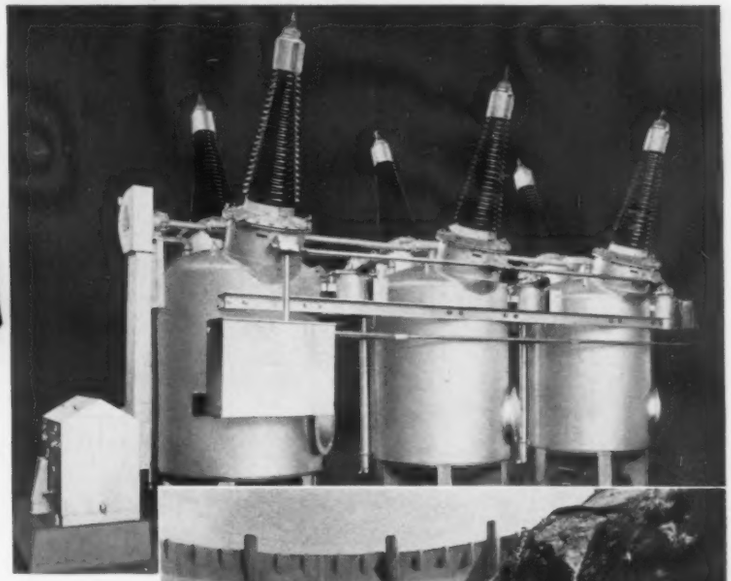
Hubbard and COMPANY

OAKLAND, CAL. PITTSBURGH CHICAGO

Engineered for

OUTSTANDING DEPENDABILITY

This PACIFIC BREAKER INSTALLED AT BOULDER DAM



• **YOU'LL GET** long and uninterrupted service with a noticeable saving in maintenance from Pacific Electric oil circuit breakers because they are correctly designed and carefully fabricated by experienced engineers from high quality materials.

Investigate the economies in operation available through installing these breakers by consulting our nearest representative.

Pacific Electric Mfg. Corp.

5815 3rd St., San Francisco, Calif. Dunes Highway, Gary, Indiana

They're Built to TAKE IT !!

Two examples of stamina and reliability. At the left the gigantic Boulder Dam, and at the right ten Gardner Transformers installed by U. S. Bureau of Reclamation at Boulder City.

THAT'S WHY GARDNER TRANSFORMERS GAVE BOULDER CITY *Efficient Service*

● **For the Boulder City distribution system, Uncle Sam's engineers selected Gardner Transformers. They knew that Gardner builds transformers to take it —to give efficient, economical and trouble-free operation even under extreme climatic conditions found on the Nevada Desert.**

For quick delivery, outstanding reliability and economy specify Gardner Transformers. They are built in the only plant in the West specializing in transformers for all purposes.

The Gardner Electric Manufacturing Company has served leading Western power companies for over twenty-six years. Investigate today why Gardner has saved these companies money on standard and special transformers and on repair service.

Whatever your transformer requirements are call on Gardner. We give quick service, fast delivery. Send for catalog.

GARDNER ELECTRIC MFG. CO.

4227 Hollis St., Emeryville, Calif.

REPRESENTATIVES: Geo. E. Honn Co., 420 Market St., San Francisco, Calif.; Utilities Supply Co., 1736 E. 15th St., Los Angeles, Calif.; Langman Eng'g Co., 1412 N.W. 14th Ave., Portland, Ore.; Industrial Electric Co., 1304 Stewart St., Seattle, Wash.; Modern Electric Co., 37 Richards St., Salt Lake City, Utah; Kranefeld Eng'g. Co., 3416 14th Ave., Denver, Colo.

▼ MAIL ▼ COUPON ▼ TODAY

GARDNER ELECTRIC MFG. CO.,
4227 Hollis Street, Emeryville, Calif.

Yes, please send me your catalog... I am interested in
☐ standard transformers ☐ special purpose transformers
☐ repair service.

Name .....

Street .....

City ..... State .....

Little Waters and Happy Valley

"WHAT is that little book with the flossy cover that seems to have held your interest for the past two or three evenings?" This from Electra as we prepared to listen to Fred Waring and his Pennsylvanians.

"That, my dear, is a government document dressed up like an expurgated version of the Arabian Nights for the easy consumption of intelligent but under-educated farmers."

"Seems like Uncle Sam is putting on airs," said Electra. "I never saw a U. S. Printing job dolled up like that."

"Then you haven't been following New Deal publishing," I retorted. "Those in power have learned that when the facts are weak the printing must be strong. You should see some of the brochures turned out by T.V.A. and R.E.A."

"But what is so amusing about this particular book?" Electra persisted.

"It is called Little Waters and has to do with erosion," I explained.

"I don't see anything funny in that," said Electra, picking up a dropped stitch.

"Most New Deal syllogisms are funny, Electra. Do you happen to know what a syllogism is?"

"Sounds like some kind of a serum to me," she commented.

"With no desire to bore you," I began, as I filled my pipe, "let me explain that a syllogism is a form in logic whereby two facts are supposed to lead to a definite conclusion. For example, bread is fattening—that's the first fact. You eat bread—that's the second fact. Therefore . . . . ."

"Never mind. I get the general idea. And I suppose you think that is funny."

I ignored her and continued. "The arguments of the New Deal are not so conclusive, as I will endeavor to demonstrate if you will allow me to discuss this diverting book."

"O. K. But pardon me if I yawn occasionally" was her polite reply. And so I made some remarks which are here recorded for the benefit of my Public.

"Certain of the New Dealers, having discovered that there were occasional objections to having T.V.A.'s scattered all over the country and recognizing the plain fact that some votes were being missed in regions not traversed by great rivers, set about to see what they might do for suffering humanity—particularly farmers. In this profound search, the Little Waters were revealed. A Little Water, let me interpolate, is anything from a trickle to a brook and it may be found almost anywhere—even on the desert at times.

"There are so many of these that, by spending a few dollars on each, the government can get rid of (excuse me) a hell of a lot of money, than which nothing is more desirable just before an election.

"However, there is no object in doing this unless you can tell all the voters about it—hence this book. It points out that the Garden of Eden is now a barren desert because the Little Waters were not restrained and consequently washed away all of the top soil. Beware, voters, or the same will happen in America and then what will Posterity do?

"But the kick comes in the last chapter which is a forecast of what may be written at some future date following the complete domination of the Little Waters by Franklin the Great."

"Gosh! Will he be President that long " Electra interrupted.

"I have heard that such is his intent. May I proceed? Thank you. The scene is laid in Happy Valley, a hypothetical spot supposed to be typical of our entire rural area. Here all was serene, following the conquest of the Indians. The forests were cleared, homes were built, bountiful crops were produced. fortunes were made and the taxes were paid until . . . until erosion raised its menacing hand and threatened to wash Happy Valley into the sea. At this critical juncture the New Dealers arrived with the celerity of the Marines. They surrounded the Little Waters even to the remotest mud puddle with their rallying cry THEY SHALL NOT PASS. In Happy Valley alone, and it's no larger than Golden Gate Park, 3,142 dams were built. And even the place where Mrs. Clancy dumped the wash water had its restraining terrace. Every gully had its miniature Norris Dam.

"To make the job complete, each little dam on each Little Water was accompanied by its own little powerhouse and presumably all of these (I told you there were 3,142 in Happy Valley alone) were hooked together to resemble the British Grid.

"The book fails to give detailed figures on all this but it is not difficult to estimate the size of these various projects. The principal drainage of Happy Valley is through Wilson's Creek, a stream which Jesse Owens could easily jump at its highest stages. With the finest of engineering it could be made to generate 17 kilowatts most of the time and probably could be kept turning throughout the summer. With a proper diversity factor, it would be capable of supplying energy for a number of curling irons.

"Wilson's Creek in turn is formed by the union of two tributaries — both nameless. One runs through Slim Johnson's pasture and the other has its source in Sloggin's Swamp. Obviously, these powerhouses would be somewhat smaller but they have their place in regional planning.

"There are several other smaller rills that empty into these two main tributaries and it is on these that most of the powerplants were built. Some are so small that they look like converted hair-dryers and their armatures resemble one from Junior's toy train. From these few details you can see how Conservation has arrived in Happy Valley."

"All of which sounds like a tall story," Electra interjected.

"Then let me read from the book," was my rebuttal. "I quote. 'Since they had electricity in the Valley it is like living in town. They had to wait a long time for it, but finally it came. . . . During a considerable part of the year the farmers get it from the little station at the reservoir at Valley Center.' End quote.

"And so the Abundant Life came to Happy Valley. Land that was threatened by erosion again blossoms as the rose; the young folks are no longer drifting to the city but have decided to cast their lot where life is sweet; the potato bugs have moved into the next county; the Widow Brown has raised the mortgage on her farm; there is new linoleum on the floor of the general store; Si Perkins' sow has duodecimatuplets; Uncle Abner's rheumatiz has been cured and Sloggin's Swamp is now a ten-hole golf course—nine for playing and one for drinking. Electra, are you listening?"

"No. But I want to. Turn on KFRC."

EDITORIAL + + +

Boulder Dam

WITH the completion of Boulder Dam and powerhouse, the West can add another notable engineering achievement to its list of world renowned hydro-electric projects. To speculate about the future brings into sharp focus the fact that the Boulder Canyon project is something more than the world's largest generating plant. Common sense brings the realization that some day the rich oil fields that provide the Pacific Coast with low cost oil and natural gas may become exhausted. If and when that time comes, the law of supply and demand may raise fuel prices to a point that will make even the most remote of hydro-electric projects more economical producers of kilowatt-hours than the steam plant at the load center.

With this possibility in mind, Boulder and similar projects serve a dual purpose; that of conserving irreplaceable natural resources and that of providing reliable sources of power for the future. While it is impossible to evaluate today's plants on tomorrow's economics, this factor assuredly increases the justification for Boulder Dam which already has been justified in today's economics by power and water contracts which will amortize its cost in 50 years.

In presenting a historical picture of its great development in this issue, attention is called to the engineering features which have been pioneered by the U. S. Bureau of Reclamation, the Los Angeles Bureau of Power & Light and the manufacturers who provided new apparatus to meet the new requirements of generation and transmission. To those organizations all credit is due for contributions which promise still more effective exploitation of the West's vast hydro-electric resources.

ELECTRICAL WEST takes advantage of this opportunity to acknowledge their courtesy and cooperation in providing the photographs and engineering data necessary to compile the pictorial history of the project.

Gas Men Step Out

AS it doffs its hat to the gas industry, the electrical industry should hang its head in shame. This month with fanfare and trumpets the American Gas Association launches a $1,500,000 national cooperative advertising campaign to impress upon the public that gas is "the last word in . . . simplified operation . . . the perfect answer to every domestic need for heat." Dominant theme will be "Modernize Your Home With Gas." Seventy per cent of the gas utilities are cooperating in financing the campaign to the extent of assessments at the rate of 4c per meter.

What memories this news should bring to the sales and merchandising men of the electrical industry! How they must harken back to the surveys of the '20's, the recommendations of the sales committees of the old N.E.L.A. Commercial Section, the J. Walter Thompson report, the plans of the defunct S.E.D., the speeches, the editorials in the trade press—all pointing to the desirability of a great national electrical promotional drive, the benefits which would come from such a campaign, how it might be financed and what it would accomplish.

True the electrical industry has in the meantime undertaken sporadic specialized campaigns such as the cooperative effort that launched the electrical refrigerator on its spectacular march to sales of 1,500,000 units a year, and the current Better Light-Better Sight campaign. But these are minor when compared to the present effort of the gas men. They serve but to prove that a great national promotional drive on domestic electrification would pay well.

In wishing the gas campaign success we harbor a selfish motive: It may awaken and arouse the electrical industry to similar action, on a bigger scale.

A Youngster Starts in Business

IF this be political, make the most of it.

On his drought tour, the President spoke of America as a nation which must now take on the responsibilities of maturity — that it is no longer young. Strangely, this metaphor so applies to the President's power policy itself that it is well worth a thought.

By what accident it was—and the explanations volunteered have been many — President Roosevelt clenched his Dutch jaw on an oath to show the power industry how its business should be run, he has certainly had his day. He has used his big opportunity to go into the power business in a big way.

Like any young wireman who decides to go into business for himself, he has also jumped to the conclusion that the oldsters who were running the business were getting rich quick. There seemed to be so much spread between the cost at the switchboard and delivered price that surely all of it was unconscionable profit. Senator Norris had told him so, and the Senator has always been an honorable man, and a staunch "liberal." Therefore he would show *his* customers that it didn't take so much overhead to run a business. He would cut prices and get a big volume and just show these old fogies a thing or two.

Mr. Roosevelt has been in the power business nearly four years now, not a very long time to be sure. But signs already indicate that he is beginning to realize that it isn't all gravy. Apparently, experi-

ence alone, and not advice, will convince the stubborn President. If the private power industry can survive several more years of his amateur competition, he may yet learn enough about the business to make a fairer competitor. Again like the young, cocksure contractor starting in to set the world afire, he can go on giving away with a lavish hand as long as his capital holds out or he can get credit from his suppliers. In the President's case the capital or credit isn't his own, it comes from the public and hence his concern over its safety will never be as keen as must necessarily be true among his private competitors. And at the extreme, he can quit the job in four more years, and not carry the headaches of balancing the income to the outgo from then on, which his competitors likewise cannot do.

Yes, experience is beginning to ameliorate his former attitude. TVA, for instance, is now ready to play ball with the Southeastern power companies and proposes a power pool for better load and demand balance. Basil Manley, vice-president of the Federal Power Commission, gave a learned paper on the value of integration of private and public power resources for greater public benefit at the World Power Conference. Some of the realities of operation are forcing themselves upon the young experimenters who started off with such grandoise ideas. We may look to a more realistic policy as regards distribution of the outputs of Bonneville and Grand Coulee in due time. Certainly the integration of these vast surpluses will take more experience and skill than the utopian theories of Senator Norris contain. Among flesh and blood human beings, instead of some super-race of creatures fit for socialistic idealism, a realistic policy has a way of forcing itself in due time. Rarefied air proves a bit thin to support the wings of the angels.

The pity of it lies in the magnitude of destruction of faith in the integrity in private business that has resulted from this exalted price cutting and defamation of competitors coming from the White House. A fine industry, on the whole more decent and socially minded than any other in America, has been branded by the highest authority in the land. The faults and mistakes of a few have been burnt into the haunches of thousands of other innocent and devoted members of the business. It is hard to understand or forgive this immature and unfair judgment from the President of the nation. If anyone should be slow to crucify without trial and sober consideration of the facts, it should be the chief executive.

One admires the boyish exuberance and charm of the man Roosevelt, yet winces under his sophomoric and undisciplined displeasure. Time may prove that many of his ultimate objectives are highly desirable. Yet is it not possible that had he examined more closely into the utilities, their methods, objectives, policies, and experience, he could have seen a strong trend, soundly based, in the direction he desired? Impetuous youth again!

Such social development even he shall find slow and painstaking. Here among the utilities it was progressing under its own steam, paying its own way, yet nevertheless in progress. Customer ownership, for instance, was far more sound and responsible than the loose, unresponsible and too often politically dominated government ownership. A measure of social security was a fact among its employees, who suffered least in layoffs and pay cuts of any industry during the depression. Its social contributions in taxes proved a far more economical collecting method for civic benefits than the clumsier machinery of state and federal tax agencies. Long time planning was an actuality and the principle of forging ahead with construction projects in order to keep employment up was carried on for two years after the beginning of the depression. All of these facts the President might easily have learned had he made an investigation fairmindedly and free from preconceived prejudice. He chose, rather, to listen to the life-long advocates of public power development on the simple assumption that, since they had nothing to gain from it themselves (save a sense of personal power), their advice was apt to be less self interested than any other. Even that assumption is open to question.

Yes, our President is now a power tycoon. He has borrowed his capital from the public for a great federal power system. He will learn as he goes along from the school of hard experience which has taught the private utility owners and managers the same hard lessons. In time, no doubt, he would make a fair enough competitor. But what will the next amateur who inherits this federal power trust from Mr. Roosevelt do with it? Must the industry go through this same painful and unethical competitive educational campaign over and over again in the future?

The Public Will Be Damned

NO PRIVATE utility could ever hope for nor would it seek to exercise the arbitrary and discriminatory powers to be vested in governmental agencies proposed in the public power bills which are to be voted on in Oregon and Washington in November. Private utilities are subject to strict regulation and accounting whereas the state bodies to be created by these measures would be far beyond the reach of any regulatory authority. Such despotic political powers as these measures provide presage tyrannical infliction of untold injustice, damage and even ruin to both capital and property. In this era of bureaucratic invasion of the rights of business and even citizens, the public stands ultimately to suffer irrespective of any rainbow tinted promises of benefits which the proponents of these measures hold forth as bait for votes. The iniquities of these measures need only to be brought to the attention of the voters to insure their defeat. Democracy and liberty will not endure the granting of such extraordinary powers.

Significant Trends + + +

[Signposts which point the road to improved business or method, brief, pertinent, useful hints as to HOW someone has blazed a new trail]

Electric Heating Protects Rayon in Knitting Plant

One of the first all-electric factories in the United States, the Arthur Bone, Inc. knitting plant in Los Angeles, typifies the economy and other advantages of electric plant heating. The rayon knitting process is carried on in the warm, clean air produced by a 54-kw. electric heating installation. This was installed by the Ilg Manufacturing Co. after engineers of the latter concern had convinced the plant management of the economy and improved working conditions electric heat would provide.

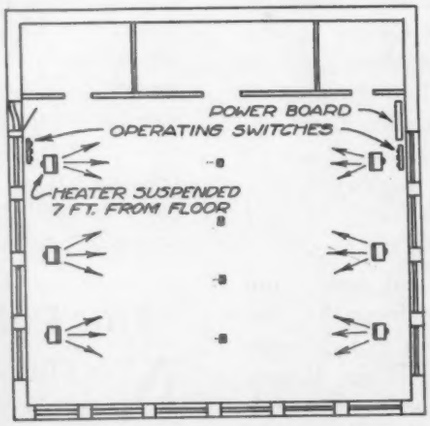
Atmospheric conditions and cleanliness of air in which rayon is processed are vital to obtaining the best product. Had a fuel other than electricity been adopted for heating, an air cleaner would have been essential. Burning fuels also would have increased the fire hazard.

With electric heat, the large first cost of a central heating plant was eliminated by the use of circulating-type unit air heaters. Furthermore, supplementary air cleaning equipment was unnecessary, and close temperature control was assured. These advantages more than offset the slightly higher operating cost.

Circulating-type electric heater showing the diffusing effect of the louvres

. . . In Engineering

The installation as adopted consists of six 9-kw., heavy duty electric unit-type heaters suspended 7 ft. above the floor. Three units are mounted on each side of the room. Air is circulated by a small fan, which is located behind each unit and forces the air through the finned-heating elements and louvres which control its direction and permit an even diffusion of warm air over the working area of the plant. Proper placing of the units has made possible even and uniform heat distribution. The units are capable of maintaining a factory temperature of 60 deg. F. against a 35-deg. F. ambient out of doors. Economy is increased by the fact that the area between the units and the ceiling is not heated directly, this space often being one-third of the volume of the room.



Plan of unit-type circulating electric heaters in the main factory room

Each heater is housed in a rectangular cast-iron cabinet. The heating elements are of nichrome wire, incased in porcelain, and contained in sheet-iron tubes bearing circumferential fins. Air is driven around the tubes and fins by the pressure-type, propeller fan. Heat transfer keeps tubes and fins at black heat and insures against burned air.

A further saving in operating cost was accomplished by the fact electric installation eliminated necessity of employing a furnace-tender. The installation at the Bone plant is manually controlled. Because of the delicacy of the rayon process, the company has found it most expedient to maintain on the factory floor a man thoroughly familiar with rayon manufacture, who can constantly control atmosphere and heat conditions.

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Metered Refrigeration Newest Idea for Building Service

What is said to be the first successful attempt to meter and sell liquid refrigerant at so much per pound is reported in Florida. Just as the normal office building may sell steam heat, water or electricity to its tenants, the Lincoln Theater Bldg., at Miami Beach sells controlled air conditioning through an unusual installation made by the Carrier Engineering Corp. The system provides for the proper division of operating costs between the 1,300-seat Lincoln Theater and the remainder of the building. Three liquid meters are used, one being a master meter while the other two sub-meter the refrigerant used by the theater and by the balance of the building. Tenants are reported to be well satisfied with this equitable distribution of modernizing costs.

•

• A STEAM-ELECTRIC LOCOMOTIVE, to go into service early next year on the Union Pacific R.R., is under construction by the General Electric Co. Designed to haul 1,000-ton passenger trains, the unit is rated at 5,000 hp. Most unusual of its many departures from present steam locomotive design are these: it will employ steam condensers, a turbine as the prime mover, higher boiler pressure, will be propelled by traction motors. Improved firing will allow practically smokeless combustion. High fuel economy and speed of 110 mi. per hr. are expected.

At left, the cafe, and at right, the rainbow-illuminated cocktail lounge, in the twin Mecca and Oasis establistment at Ventura

Rainbow Coloring for Cocktail Lounge Lighting

Seventeen, 60-watt lumilines, clustered in a trough, form an effective part of a new lighting installation at the Mecca Cafe and Oasis Cocktail Lounge in Ventura, Calif. Achieving a rainbow effect over the rear area of the cocktail lounge, the colors range through blue, green, surprise pink and orange.

To provide ceiling illumination, two Curtis Edge-Ray indirect units were redesigned for pedestal purposes. Lamp wattages in these vary through 400, 600 and 1,000 watts. Equipment was designed by David H. Miller, Jr., Southern California Edison Co. lighting engineer, and was installed by the Seaside Electric Co. of Ventura.

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Radio and Book Aid Better Light Program

Sensational and important aids in the fall and winter Better Light-Better Sight program available to utilities of the West include a cooperative radio plan and the dissemination of a book, "Why We See Like Human Beings." Announcement of these spectacular aids was made in the September *"Better Light-Better Sight News."*

Briefly, the radio program consists of a series of radio transcriptions under the general title "The Open Door." Walter B. Pitkin, author of "Life Begins at Forty," is made the editor of this magazine of the air which is to feature well-known novelists, news syndicate writers, contributors to large magazines and national figures. Music from outstanding talent and orchestras will also be recorded in the program which, on a network basis, would cost not less than $2,000 per show. Because of the transcription method programs are promised for about $20 each.

. . . in Lighting

• A PROPOSAL FORM, embodying not only a lighting proposal, but painting, venetian blinds and color scheme suggestions, is being used in the Better Light-Better Sight Campaign in the San Francisco Division, Pacific Gas and Electric Company. Elizabeth Banning, colorist, is working out the interior color scheme in conjunction with this lighting proposal. Color charts are attached directly to the proposal, permitting the prospect to see exactly what he is to receive.

●

• VALLEJO, CALIF., will materially increase its street lighting as a result of action by the city council which authorizes the Vallejo Electric Light & Power Co. to install 114 additional electroliers on the two main streets of that city. In addition a lighting district has been organized in one of the residential subdivisions adjacent to the city which will require 45 overhead lighting units.

● ●

Decorative Effect Accomplished By Lighting

Lighting engineers of the Utah Power and Light Co. beautified Samuel's Shoe Store in Salt Lake City by deft modernization. Shoe boxes were made invisible but quickly accessible by means of the partition along the left side of the room which provided double storage space and an opportunity for display niches utilizing concealed lighting. Beams in the ceiling were adapted for general illumination as shown, the absence of suspended fixtures enhancing the appearance and spaciousness of the establishment

New Lighting Ideas

"A Picture is Worth Ten

A Market Without Hanging Fixtures—

The eye is attracted by light. If the light is upon the merchandise, rather than in a fixture dangling before the eyes, the merchandise gets the attention. At Romey's market, 5411 Geary St., San Francisco, G. A. Trosper, lighting specialist of Pacific Gas and Electric designed the lighting to be "built-in," and the merchandise at the front windows jumps at purchasers from intensities of 250 to 425 foot candles; meat counters 30 to 55 ft. candles; fruits and vegetables 35 to 60 ft. candles; poultry 65, and grocery 17 to 26 ft. candles. And not a fixture of ceiling or pendant type is in sight. Connected load is 25.5 kw.

The front, shown above (left), is entirely of glass. Behind the neon sign is brown marble glass; below it and on the signs with the words "Market," and "Fine Foods," is flashed opal, behind which are 40-watt lamps on 12-in. centers.

Interior lighting is directed through ports in the ceiling down on counters and merchandise below. There are 40 new type X-Ray reflectors with 200-watt lamps on 5-ft. centers, 12 ft. above the meat and vegetable counters. Ten 500-watt Pittsburgh reflectors are used in the ceiling back of the counters and in the grocery department. All of the units are directed upon the merchandise, spill light illuminating the aisles. A catwalk above the ceiling provides access to reflectors for lamping and servicing.

Front windows have 19 ft. ceilings, above which near the glass are 15 Pittsburgh 500-watt concentrating spots, now lamped at 300 watts. Light from them is projected through ports in the ceiling, thus removing units from the line of vision and directing all light on the foods.

Above—top, front of the market at night; center, looking toward the front with fruit and vegetable counter left, and meat counter right; lower picture shows window at front (left). Note the lack of glare from the lighting. Skylights are used for daytime illumination but have no lighting units behind them

Excellent murals on upper walls by Dupont are lighted by 4 special urn type chromium units on each side, designed by Preston Hopkins. They are placed on top of meat counters and on the grocery shelf. One is seen at center of the picture on the left. The newel post fixture, also shown, likewise made by Hopkins, lights stairways up to the offices. An additional lumiline lamp built into the back lights the murals and adjacent walls. Lindy Electric Co., San Francisco, was electrical contractor who cooperated to produce this unusual lighting and wiring installation. Architect was Irvin W. Goldstine

Told in Pictures

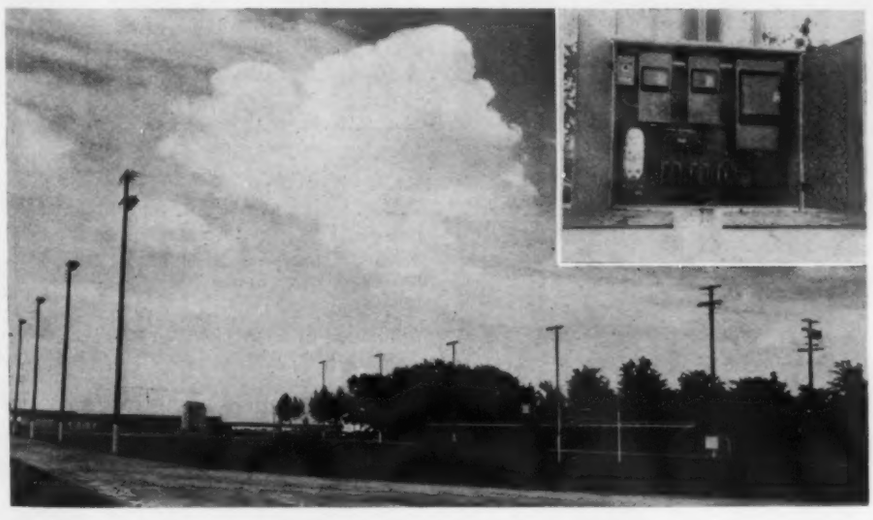
Thousand Words"—Confucius

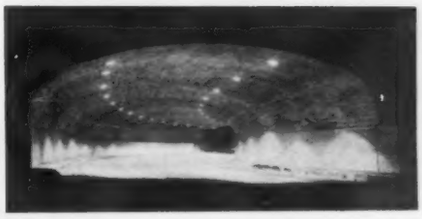
—In-built School Lighting

Long Beach Polytechnic High School, Long Beach, Calif., has the unique distinction of having new buildings lighted throughout by units built into the ceiling. Reflectors are mounted above the ceilings behind Holophane control lenses mounted flush with the ceiling. The photographs show the excellent distribution of light at the working levels, on the blackboards, and the glareless appearance of ceiling and light sources. The library, shown in the lower picture at right shows that the light is upon the tables in adequate intensities for close visual work. Installation was made by Kuster-Wetzel Electric Co., Long Beach electrical contractors.

—Softball or Football Optional

Lighted play fields like this at Manteca, Calif., have likewise been installed at Oroville and at Chico union high schools. The Manteca field, shown below has ten poles, 8 of them 60 ft., 2 65-ft. at the end for crossover. On each are mounted 4 G. E. 1500-watt floodlights, operated at 10 per cent overvoltage. Wiring is 4-wire, 3 phase, the wires mounted on individual clevises spaced 12-in. apart. Control is at a switch and meter box (see inset) at one corner of the field. At Oroville, contractors Joslyn Electric Co. and Warmack Electric set 6 poles with 4 reflectors each so as to use for soft ball, the last two poles on each side being shunted out by individual switches. Chico Electric Co. made the installation at Chico. Roy Myers, of General Electric Supply Corp., San Francisco, designed the jobs in each case.





Heavy night traffic through Roosevelt Highway tunnel at Santa Monica, Calif., demands good lighting. Built into the ceiling, flush, were 28 units with prismatic glass reflectors and control lenses. An adjustable bracket, so that either 250 or 400 c.p. lamps may be used, is provided. Spacing is 29 ft., on 30-ft. centers along the 400-ft. tunnel. Note how the light is concentrated at the vehicle level. Bennett and Taylor, contractors, made the installation

Glass Brick Used in Idaho Utility Office Remodeling

GLASS brick is used in an extraordinary manner both in the decorative scheme and to light the new offices which the Idaho Power Co. is successively remodeling among its various divisions. Pocatello office was first to have such a new office arrangement. Now the remodeled office at Emmett has also been opened and work is in progress on the Payette office for an early opening.

In the Pocatello office the entire front walls are built of glass brick, transmitting 70 per cent of the light but diffusing it so that at night the entire front becomes luminous with only a few lighting units placed behind the glass brick. Color lighting for special occasions may be easily arranged. Windows have streamlined backs of curved micarta walls trimmed with aluminum. All old-time contrivances of wood construction such as panels, beads, moldings and other dust-catching surfaces are omitted, giving a truly modernistic appearance and easily cleaned surface.

The Emmett office likewise is a combination of glass brick trimmed in black glass and white metal. Interior illumination comes from no overhead fixtures at all; all the illumination derives from wall coves constructed of glass brick, giving a soft, diffused light. Glass brick is again used in the construction of a semi-circular counter with colored lights showing through the bricks. Air conditioning in the new offices is a part of each new installation.

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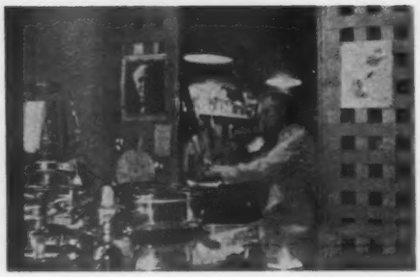
Service Department Builds Wiring Sales

MANY contractor-dealers assume that the appliance and small motor service department is small business and that the proprietor should spend his time looking for wiring jobs and superintending those that he has. They leave this work to a boy or some clerk who has been instructed in the simpler phases of it.

This is not the case with H. H. Burgy of the Burgy Electric Works, Vancouver, Wash. He looks upon the direct personal contact with the public through the service department as his greatest business builder, provided he does the bulk of it himself.

He goes at the work in a different way from the ordinary disinterested employee. His shop is where the customer can see into it. He posts himself at the bench at the door of the shop in full view, and works there. When a customer comes in with an appliance to be fixed, he personally meets the customer at the counter in front of the



shop door. There he explains to the customer the nature of the trouble, what caused it and how it can be remedied to entire satisfaction—no makeshift jobs. Permanency is his motto.

Often those things which to the ordinary repair man seem to call for the simple renewal of a small part, when run down call for complete overhaul of the equipment to make it as good as new. Frequently it calls for a trip to the home where the appliance is located. By making a highly satisfied customer in this direction, and impressing upon his or her mind that here is a contractor who thoroughly knows his business and is reliable, he is given an opportunity to figure on wiring jobs as they come up. Frequently he is the only one called in and it is straight time and material work.

...in Construction

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Inclined Elevator for Stairs is New Wrinkle

A HOME elevator named "inclinator," which can be adapted for use wherever there is a straight stairway between floors, has been installed in several Los Angeles homes recently. Manufactured by the Inclinator Co. of America at Harrisburg, Pa., it is distributed in California by the Inclinator Co. of California.

The device has two seats which can be folded out of the way when not in use. It has a small platform upon which one can stand or place the feet. A twin seated car is supported on a roller truck that runs within a specially constructed rail secured to one side of the stairway. A small electric motor operates the device through a worm gear, winding drum and cable. Switch-buttons on the car and at the top and bottom of the stairs permit operations from three points.

The seats and platform fold up and project only 5 in. from the wall when the car is not in use.

Saving labor in carrying trays, laundry, traveling bags, children, the device is also welcomed in homes where there are invalids and elderly persons, convalescents, or people who demand its convenience. A similar device for installation where stairs turn corners is made to run vertically. It is known as an Elevette in that case.

Otis Elevator Co. also has a home elevator of small size and an electric dumb waiter which are finding more and more popular appeal as homes are being equipped more mechanically for modern living.

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Radio Program Really Promotes Wiring

A NEW slant, and an effective one, in the promotion of adequate wiring is being used in San Diego. A series of radio playlets under the general title "The Home Builder's Scrap Book" tell a connected story of the experiences of a young couple planning to build their own home. They are sponsored by the Bureau of Radio and Electric Appliances. Suggestions for incorporating various details into the home and particularly hints as to the electrical facilities and appliances are woven into the story.

At the end of the broadcast, which occurs on Sunday of each week, a list of homes in San Diego County which has been checked by the Red Seal representative of the San Diego Consolidated Gas & Electric Co. and found to be adequately wired is given so that visitors may locate them easily.

Recognition of the fact that large numbers of prospective home buyers visit all the available newly built homes each week has been capitalized in this program. Likewise, builders of homes who have had several of their previous homes turned down because of inadequacy are making a strong ef-

fort to qualify with sufficient outlets and electrical conveniences so as to merit free radio advertising through this program.

"Due to the tremendous pace which the sale of all types of electrical appliances has set during the past few years," says J. Clark Chamberlain, manager of the Bureau of Radio and Electrical Appliances of San Diego County, "we now are encountering a peculiar problem. In thousands of instances installation of appliances has completely taxed the existing outlet facilities of the homes involved. Constructed before our modern appliances became popular, many of these homes have actually reached the limit of stretching outlet capacity and the addition of more appliances now becomes a physical impossibility. The seriousness of this situation has been rapidly growing, as all salesmen can testify. To help in counteracting it, the Bureau program, announced at the banquet meeting of last month was launched."

The radio programs are supported by ample newspaper space carrying a similar idea of calling attention to the radio programs.

Homes that have been certified as adequate are placarded as such. Then at each electrical outlet a small, three-color card is placed. On the card is the wording, "The Door to Cheap Service. Easy to install, ask your electrician."

Because the program has provided an incentive for the speculative builder to install wiring for the advertising benefit it will bring to his home, this program has been unique and really achieved remarkable consciousness among builders for electrical facilities.

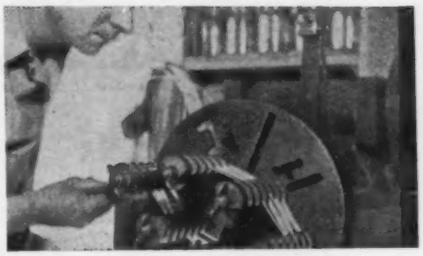
●

Lathe for Winding "Mush Coils" Quickly

An easy way of making up the so-called mush-wound coils has been devised by "Mac The Motor Man" of Spokane, Wash. He uses the face plate of a lathe, with graduated circles cut in the face of the plate. The latter is mounted on a special motor driven mechanism for turning the plate, which is provided with a revolution counter.

Spindles were turned out of maple wood, the same being about 9 in. long and containing grooves ¾ in. wide by the same depth for receiving the wire. Ninety degree segments were then cut from these spindles and bored through endwise to receive a long bolt, the head of which is held in the recesses in the face plate. The segment spindles are then tightened up by means of wing nuts as shown in the photograph.

The size and shape of the coils is determined by the setting of the spindles



in the face plate, the graduated circles offering a ready means of making record of the setting for winding future similar coils. With this device, two sets or three mush-wound coils can be made with one setting.

It is evident that the device cannot be used for making form-on coils and is only suitable for mush-wound coils, but even for that purpose it is a great time saver.

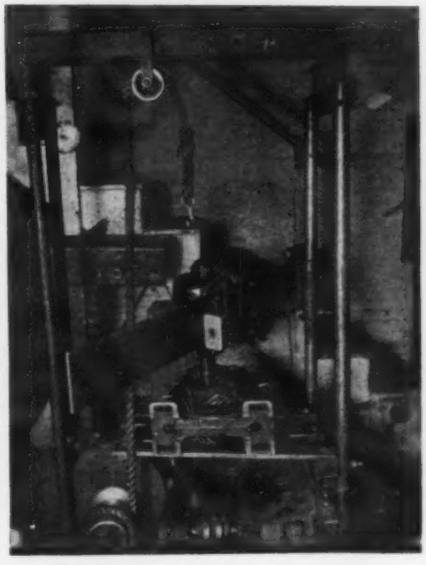
. . . in Motor Shops

Stripper for Motors Speeds Repair Jobs

The large part of the cost of rewinding a motor lies in labor charges, some of which are not very productive. Among these is the stripping of the frame of old coils preparatory to the rewinding operation. This takes varying lengths of time which raise the cost of doing rewinding materially.

E. E. Elzea, of Elzea Motor Works, Fresno, sometime ago evolved a mechanical stripper for motor frames which has worked very successfully. As shown in the illustration a frame of heavy iron mounts a ¾-hp. motor in a vertical position on a swinging arm, riding on ball bearings so as to allow

Coil stripper which saws away the coil and yanks it out



free movement. Old saws of one kind and another are used on this motor which are turned backward so as not to have the teeth catch in the upper wire to be stripped.

This motor is lowered into the stator frame, that has been bolted down to a platform, and the saw is moved about the periphery of the frame, wearing out the windings rather than actually cutting them. When they have been severed the stator is turned over, bolted down again, and by means of a hook and rope over a pulley to a winch spool, the coils are yanked out quickly. A 2-hp. motor connected to a 9-to-1 worm gear on the winch spool gives plenty of power for pulling the coils out of the motor stator. When the coils are found to be too hard the stator is placed in the bake oven for a little while to heat and loosen. Stripping which used to take an hour and a half is now done easily within 15 min. The device is especially good in semi-closed slot machines.

●

• ANOTHER ONE FOR THE BOOK—So writes J. O. Case, president, Quality Electric Co., Los Angeles. On a Tuesday afternoon a 250-kva., 6,900-230/-460-volt transformer from the American Potash & Chemical Co. was sent in for complete new primary and secondary windings. On Friday, without any over time or special effort at speed, the new windings were going into the oven and two days later the transformer was assembled and back on its way to Trona. The job was done in five days and "no necessity for air express charges on factory windings." Mr. Case goes on to say, "I hope it may have the effect of making the electrical public conscious of the fact that there are, up and down the coast, facilities for handling the unusual and rush jobs in a satisfactory manner and at a minimum of cost."

●

• SERVICES RENDERED—Instead of itemizing on his time and material bills for work performed by using the item "labor," a plumber in Fresno writes in the item "services rendered" and includes in that item not only the labor of actual performance of the job but his own time in supervision and planning, according to H. H. Courtright, Valley Electrical Supply Co., at a recent contractors' convention. The idea was passed along as one which should be more generally employed by electrical contractors in their own billing and to point out that the proprietor's own time of supervision and planning was also worth something and should be charged for.

News of Note + + +

Boulder Dam Power Delivery Celebrated

For months the Electrical Development League of Southern California focused its attention on Oct. 9—the day that Boulder Dam power was scheduled to arrive in Los Angeles. The League's purpose: to see that the significance of this event in terms of happier living for the citizens of the area was fully understood.

To this end, retailers, wholesalers, jobbers, manufacturers, and contractors, working through the League, laid careful plans for a program of ceremony, exposition and pageant.

Energetic supporters of the plans for the "Boulder Power Inaugural" and the "Electrical Age Exposition" have been the Southern California Edison Co., Ltd., and the Bureau of Power and Light.

Scheduled as the opening event was the inaugural ceremony at the Los Angeles Civic Center, featuring addresses by E. F. Scattergood, general manager of the Bureau, and Dr. John R. Haynes, president of the Board of Water and Power Commissioners.

To dramatize the power's arrival, were laid the plans for the visual demonstration of its reception in the city, followed by the electrical parade through brilliantly illuminated downtown streets.

Purpose of the Exposition was to carry forward the themes, "Let's make the most of Boulder Dam power" and "California's Electrical age has just begun," by giving the public a chance to see the equipment with which the power can be converted to use.

Opening Oct. 10, in the Pan-Pacific Auditorium, the exposition will continue until Oct. 18. In addition to presenting the latest models of appliances and equipment, the Exposition offers a spectacular display of new inventions and electrical entertainment.

•

Proposed Amendment Threat To California Commission

Appearing on the November ballot in California is Proposition No. 23, a constitutional amendment which threatens vitally to affect the future of the California Railroad Commission. The amendment initially was approved with the understanding that it would merely change the name of the railroad commission to the Public Service Commission, a name which the authors and sponsors in the Legislature thought more descriptive of the commission's activities. After the amendment was scheduled for the November ballot it was found that some of the most important parts of the constitutional provisions for the commission would be repealed, including the elimination of the 6-year staggered terms of the five commissioners.

The original sponsors of the amendment in the Legislature have withdrawn their support and have publicly asked for defeat of the measure. The feeling is that if it is approved in November, it will be only because the voters are unacquainted with the hidden provisions in it. The California State Chamber of Commerce, numerous farm bureau federations as well as a number of civic organizations have gone on record as opposing the measure.

•

World Power Conference Delegates Visit West

Following sessions of the Third World Power Conference in Washington, a group of 240 distinguished scientists, industrialists and engineers, including delegates from twenty foreign countries, toured the extensive electrical developments of the Pacific Coast.

Reaching here the last week in September, they followed an itinerary which included inspection of Grand Coulee project, Diablo Dam and Seattle distribution systems, Bonneville Dam, San Francisco and high-head Sierra systems, Los Angeles and Boulder Dam.

Arriving in California the delegates were presented with an illustrated booklet presenting western electrical developments published by the Pacific Gas & Electric Co.

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Section Chairmen Named For Northwest Assn.

Appointment of the following section chairmen for the Northwest Electric Light & Power Assn. for the current year has been announced by George M. Gadsby, president:

R. W. Miller, Idaho Power Co., Boise, Accounting and Business Practice Section; George H. Wisting, Northwestern Electric Co., Portland, Business Development Section, and J. Hellenthal, Puget Sound Power & Light Co., Seattle, Engineering and Operation Section.

Berkeley Snow was reappointed executive secretary, and R. H. Jones, Utah Power & Light Co., treasurer.

Activities for the coming year were outlined at a meeting of the Executive Committee in Portland. The annual section meetings will be held next spring.

Power Companies Win in Defending Water Rights

A jury verdict in favor of four defendant corporations, the Southern California Edison Co., Ltd., San Joaquin Light & Power Corp., Miller & Lux, Inc., and its subsidiaries, and Chowchilla Farms, Inc., was rendered Sept. 5 in a $480,000 riparian damage suit instituted by twenty-two Stanislaus County land owners.

The verdict, finding for the defendants in all twenty-two causes of action, ended the longest jury trial on record in Stanislaus County. The case was heard in Modesto, Calif.

The suit was instituted in the spring of 1931 by L. A. Vandervoort and twenty-one other land owners in Stanislaus County riparian to the San Joaquin River. The claim of the plaintiffs was that the storages of the two power companies on the headwaters of the river in Fresno and Madera counties and diversion in the valley below of Miller & Lux and Chowchilla Farms had the effect of so depriving the plaintiffs of water that their crops and pasturage were not so valuable as they would otherwise have been.

The principal ground of defense was based on the constitutional amendment limiting riparian rights adopted by the people of California at an election in 1928, and was to the effect that none of the diversions or storages of the defendants had operated to deprive plaintiffs of the amount of water which their lands needed under reasonable methods of diversion and use.

•

Utah Utility Refuses Offer For Ogden System

As part of a municipal ownership agitation, an offer of $700,000 for the Ogden distribution system made by the city to the Utah Power & Light Co. has been "respectfully declined." In a letter to the city George M. Gadsby, power company president, made the statement that the company's properties are not for sale.

Petitions seeking a referendum vote on the issuance of $2,490,000 in revenue bonds for the acquisition of a municipal power and light system were to be filed prior to the end of September. Dates for an election will be set after the filing of the petitions.

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• TULARE, CALIF., was to vote Sept 30 on a proposition for incurring a $228,700 bonded indebtedness for the purchase of the Southern California Edison Co. distribution system in Tulare.

Bureau May Purchase L. A. Gas Electric System

Negotiations looking toward the ultimate purchase of the electric facilities of the Los Angeles Gas and Electric Corporation by the Los Angeles Bureau of Power & Light have been concluded by officials of the two organizations. At the same time the long-standing dispute over gas franchises of the utilities serving gas in the city were settled.

Under the terms of the agreement the Bureau will pay $46,340,000 for the utility's electric system. This figure is a compromise from the original asking price of $60.000,000 and offered price of $40,000,000.

A proposal in the form of a charter amendment authorizing the purchase will probably be submitted to Los Angeles voters early in December.

The proposed plan will give the Los Angeles Gas and Electric Corp., the Southern California Gas Co. and the Southern Counties Gas Co. franchises for serving gas to replace the existing constitutional franchises for serving gas for "illuminating purposes" under which the companies now operate. Each company will pay the city a minimum fee of one per cent of gross receipts as a franchise tax, in addition to the sum of $505,000 for past use of the streets.

Under the terms negotiated the utility's electric system must be free from bonded indebtedness and it is understood that $40,000,000 of the purchase price will be used to retire outstanding bonds. The city has an option to purchase which extends to Sept. 30, 1939.

Los Angeles Gas and Electric Corp. operates two steam plants having a total installed capacity of 148,700 kw. Total kilowatt-hour output in 1935 was 437,156,431. On Jan. 1, 1935 the company was serving 163,888 customers which represented approximately 35 per cent of the load within the city.

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• Increase in gross earnings of the Puget Sound Power & Light Co. for twelve months ending June 30, compared to the previous year was $871,-535.31 or 6.46 per cent. Gross earnings the past 12 months were $14,370,-051.08.

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• OAKLAND ELECTRIC CLUB resumed its weekly Monday meetings Sept. 14 at the Women's City Club, Oakland, at the call of L. J. Traver, East Bay Municipal Utilities District, president of the club. Informal meetings, often without speakers, characterized the weekly meetings prior to the vacation period. President Traver announced a more active program for the club for the ensuing season.

The Standard News

October 1936 — Electrical Edition

Published by THE STANDARD ELECTRIC STOVE CO., Toledo, Ohio

No Longer Expensive

The electric range has now become an accepted part of American thinking. No longer do you hear doubts expressed as to its utility. There is still a little background of doubt concerning the low cost of operation.

This doubt, however, is quickly dispelled by the user, for she soon finds that she does not have to be a miser with the current. Just normal use without fear of cost results in exactly the right consumption of current. The cost in every case is so low as to be a surprise to most new users.

This is the line of reasoning we have pursued since the first days of Standard, over twenty-five years ago. The cost of cooking electrically is not excessive, it cannot be comparably more excessive than electrical application to other uses.

Standards have always been low current consumers. Standard was born and brought up during the days of high current costs. The welfare of the user has always been foremost in our design. Standard's experience and design have over twenty-five years of background.

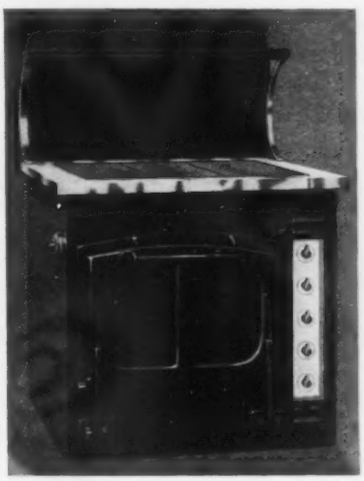
When you sell a Standard you can depend on its giving good service for many years and you can depend on its operating at the lowest cost.

Sell Standards with confidence.

CHARLES A. PIERSON.

For Hotels, Restaurants and Clubs

This is the new Model No. 804 Standard commercial range which sells for the same price as an equal size gas or coal range.

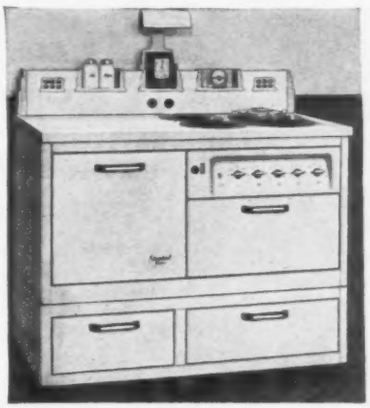


Made to set alongside of each other to get greater capacity. The high shelf is optional. The oven is 24 inches wide, 16 inches high and 26 inches deep, porcelain enamel lined. The cooking top may be flat, as shown, or with circular plates. Door and frame are unbreakable malleable iron.

This, together with griddles, warmers, coffee urns, enables you to get any heavy duty business that may come up. Look around for some of this.

The Singleton Range

This Standard was designed for the West Coast. Louis Singleton of Los Angeles had an idea for an ideal electric range. In conjunction with the range men of several power companies and Bullocks, Barker Bros. and The May Company, he worked out a model that meets the requirements of the housewife.



The oven is large and roomy with non-tilt shelves and smokeless broiler. It has perfect heat distribution. The warmer accommodates a full dinner's plates and dishes. The surface burners may be any combination desired of black SPEEDHEET or the marvelously efficient Kalmax; or the Unit Cooker may be substituted for one burner extra on order. The beautiful utility back shelf has ample room for timer and all kitchen condiments.

The number of the range is No. 1450-D.

Standard Has the Assortment

From the smallest hotplate to the largest electric range for the largest hotel, Standard has something you can sell. Over eighty distributors and over 3000 dealers sell Standards. Many have been with us twenty years or more. Clean merchandising, clear-cut sales policy, reliable merchandise and service have built the Standard business to what it is today, the oldest and largest exclusive line on the market.

Your interest will be welcomed — WRITE

THE STANDARD ELECTRIC STOVE COMPANY

Dept. C. Toledo, Ohio. U. S. A.

P.C.E.A. Plans for Two Fall Meetings

With plans well under way for the two Pacific Coast Electrical Assn. conclaves this month, announcement was made of tentative appointments to committees. Guidance committees have been working with enthusiasm in planning the discussion-group type of program.

The Southern California conclave will be held in Los Angeles, Oct. 15 and 16. The Northern California conclave will be held in San Francisco, Oct. 22 and 23. Tentative committee appointments are as follows:

Operating Economics Section

Northern Divison

Chairman: A. W. Copley, Westinghouse Electric & Manufacturing Co., San Francisco; Frank C. Boyd, Pacific Electric Motor Co., Oakland; Frank C. Angle, Allis-Chalmers Co., San Francisco; D. D. Smalley, San Joaquin Light & Power Corp., Fresno; A. E. Strong, Coast Counties Gas & Electric Co., Santa Cruz, and C. F. Benham, Pacific Gas and Electric Co., San Francisco.

Southern Division

Vice-Chairman: R. H. Halpenny, Southern Sierras Power Co., Riverside; L. A. Buese, Los Angeles Gas & Electric Corp., Los Angeles; H. W. Tice, Southern California Edison Co., Ltd., Los Angeles; K. B. Ayres, San Diego Consolidated Gas & Electric Co., San Diego; Fred Garrison, General Electric Co., Los Angeles, and R. H. Manahan, City of Los Angeles, Los Angeles.

Administrative Services Section

Northern Division

Chairman: R. E. Fisher, Pacific Gas and Electric Co., San Francisco; A. T. Kelly, Pacific Gas and Electric Co., San Francisco; C. M. Coleman, Pacific Gas and Electric Co., San Francisco; C. V. Wilbur, San Joaquin Division, Pacific Gas and Electric Co., Stockton; Grover Tracy, San Francisco Division, Pacific Gas and Electric Co., San Francisco; E. A. Crellin, Pacific Gas and Electric Co., San Francisco; R. W. Piercey, East Bay Division, Pacific Gas and Electric Co., Oakland; George C. Tenney, Electrical West, San Francisco; C. E. Grunsky, Coast Counties Gas & Electric Co., Santa Cruz, and E. Martin, Sterling Electrical Co., San Francisco.

Southern Division

Vice-Chairman: A. B. Carpenter, San Joaquin Light & Power Corp., Fresno; Lane D. Webber, Southern California Edison Co., Ltd., Los Angeles; Fred Todt, General Electric Supply Corp., Los Angeles; A. E. Holloway, San Diego Consolidated Gas & Electric Co., San Diego; C. E. Houston, Southern California Edison Co., Ltd., Los Angeles; C. P. Staal, Southern California Edison Co., Ltd., Los Angeles; J. S. Bordwell, Southern Sierras Power Co., Riverside; O. L. Moore, Los Angeles Gas & Electric Corp., Los Angeles; J. M. Bourus, San Diego Consolidated Gas & Electric Co., San Diego, and E. N. Simmons, Los Angeles Gas & Electric Corp., Los Angeles.

Business Development Section

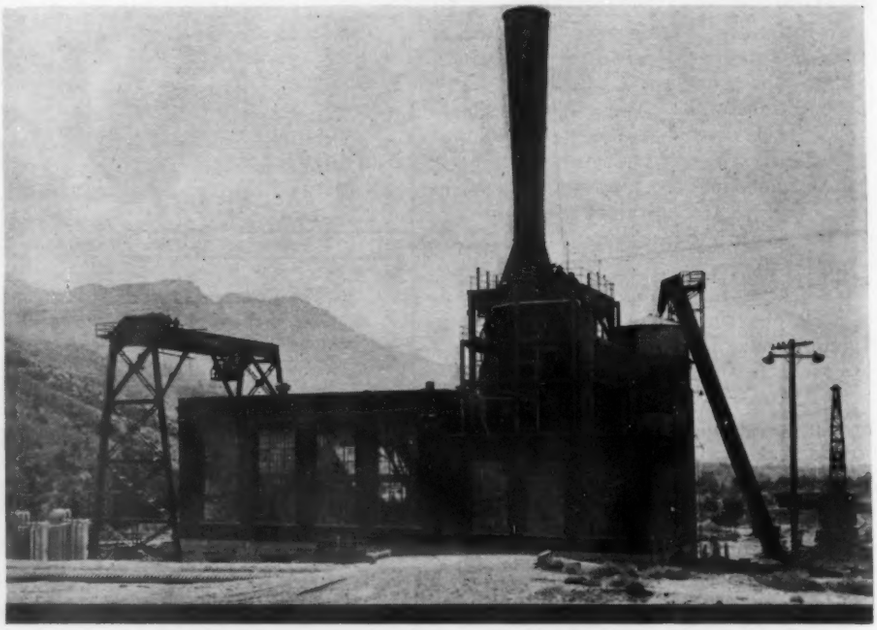
Northern Division

Chairman: A. H. Nicoll, Graybar Electric Co., San Francisco; George West, General Electric Co., San Francisco; Clyde Chamblin, California Electric Construction Co., San Francisco; Ralph Wiley, Department of Electricity, San Francisco; A. C. Miller, Pacific Gas and Electric Co., San Francisco; Carl Martin, Benjamin Electric Manufacturing Co., San Francisco; O. R. Doerr, Pacific Gas and Electric Co., San Francisco, and O. B. Johnson, Graybar Electric Co., San Francisco.

Southern Division

Vice-Chairman: H. C. Rice, Southern California Edison Co., Ltd., Los Angeles; A. E. Hitchner, Westinghouse Electric & Manufacturing Co., Los Angeles; J. O. Case, Quality Electric Works, Los Angeles; H. D. Conklin, Edison General Electric Appliance Co., Los Angeles; R. A. Crosby, Los Angeles Gas & Electric Corp., Los Angeles; Dudley B. Wheelock, Southern Sierras Power Co., Riverside; G. N. Hawley, Southern California Edison Co., Ltd., Los Angeles; H. F. Fenton, Westinghouse Electric & Manufacturing Co., Los Angeles; F. M. Raymond, San Diego Consolidated Gas & Electric Co., San Diego; Arthur C. Veit, Los Angeles County Planning Commission, Los Angeles; B. S. Manuel, Westinghouse Electrical Supply Co., Los Angeles; P. G. Gough, Listenwalter & Gough, Los Angeles; Henry Holland, Holland Electric Co., Los Angeles; H. H. Fogwell, Thermador Electrical Manufacturing Co., Los Angeles; J. Shirreffs, S & M Lamp Works, Los Angeles; T. J. McIntire, Frigidaire Corp., Los Angeles, and Harry S. Detrick, Joslyn Company of California, Los Angeles.

Utah's Newest Steam Plant



Several records have been broken by this new 25,000-hp. Provo Canyon steam plant of the Utah Powr & Light Co. First, it was completed exactly 180 days after the first ground was broken. Second, it incorporates many innovations in design, chief of which is the outdoor boiler (only the lower 20 ft. is bricked-in, the remaining 35 ft. being outdoors). The semi-outdoor construction resulted in a saving of $100,000 to $150,000 as well as provided a degree of compactness new to steam station design. The total cost of the station was $1,600,000. The 18,750-kw. turbo generator was supplied by General Electric Co.

F.P.C. Report Compares Private and Municipal Rates

Rate reports previously published by the Federal Power Commission are summarized and classified to facilitate the comparison of rates charged by both privately owned and publicly owned utilities in a new report designated as "Rate Series No. 5". Residential service, commercial light, commercial power, and large industrial power service are compared.

The report attempts to compare taxes paid by the privately owned utilities to tax payments, cash contributions to municipalities and free services made by the municipal systems. The year 1933 is used as a basis when taxes averaged only 12.5 per cent for the private utilities and when depression conditions called for large contributions from the municipal utilities to other municipal operations.

"... I COULD GO ON FOREVER SINGING ITS PRAISES!"

—says Mrs. Huesing, of Covington, Kentucky.

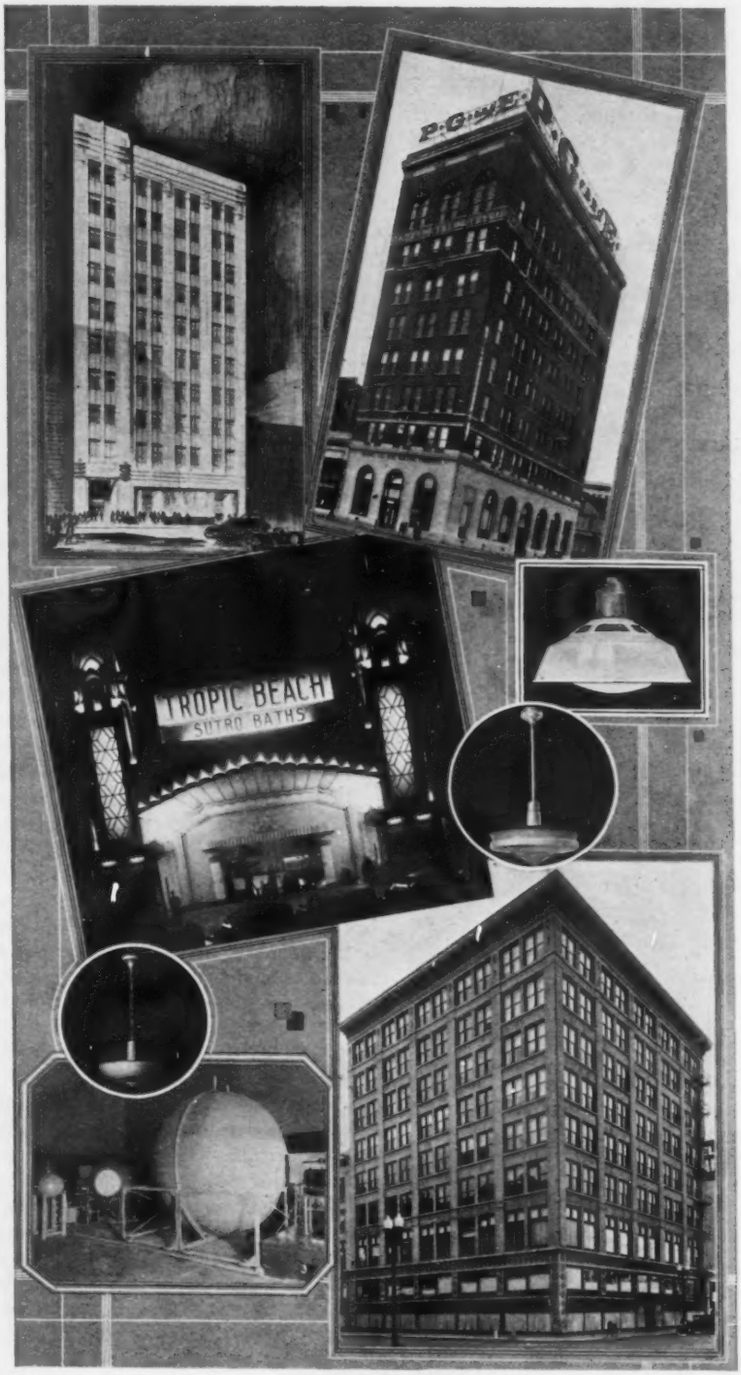
"It's not what we say—It's what the customer says that counts!"

WESIX ELECTRIC HEATER COMPANY

SAN FRANCISCO, LOS ANGELES, SEATTLE

SIGHT-CRAFT LIGHTING EQUIPMENT

. . . . . for your "better light-better sight" sales campaigns



HIGH EFFICIENCY
LOW COST
QUICK DELIVERY

• **Dark days are the signal for renewed activity in lighting—lighting for industrial yards and plants—lighting for offices—showrooms — signs — gardens. SIGHT-CRAFT *commercial* luminaires—VENUS and APOLLO—vie with any yet created for beauty, long life, easy cleaning and efficiency. The *industrial* reflectors have won favor with the most exacting purchasers—*nationally* . . . All have the superior exclusive VITROLUX *everlasting* porcelain enamel finish—are easier to sell—*more profitable* — and are available *quickly* from our Western plant. Write for complete SIGHT-CRAFT catalog—ELW-1036.**

1. SIGHT-CRAFT commercial luminaires are all-metal (no glass to break, easier to keep clean)—of striking yet conservative design—totally indirect. One western Central Station alone has over 5,000 'APOLLO' luminaires on its lines—giving real eye-comfort and greater efficiency in many schools and commercial institutions.

2. SIGHT-CRAFT industrial reflectors are available in a wide variety of sizes and types—including vapor-proof, glass-steel, sign and garden lighting units. Start your industrial lighting campaign —NOW!

3. SIGHT-CRAFT 'goes to college' at Stanford Testing Laboratory to assure its users of highest quality and efficiency. The users are now nation-wide. There's a reason. INVESTIGATE!

Stocks carried in

NEW YORK BOSTON
ST. LOUIS SEATTLE
INGLEWOOD
HOUSTON
SAN FRANCISCO

SMOOT HOLMAN COMPANY
SIGHT-CRAFT
INGLEWOOD CALIFORNIA
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SMOOT-HOLMAN COMPANY

SAN FRANCISCO
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BRASS BUSHED
for greater strength

•

Hemingray Adds to its Long List of Advantages

1. Brass bushed smooth threads for insulator pin.
2. Greater mechanical strength.
3. Sustained high dielectric strength.
4. Unaffected by sudden temperature changes.
5. Withstand maximum insulator pin expansion.
6. Never age or deteriorate.
7. Controlled uniformity of product.
8. All surfaces impervious to moisture.
9. Tougher—withstand rough handling.
10. Clear and flawless for easy inspection.

Owens-Illinois Glass Company,
Hemingray Division, Muncie, Ind.

HEMINGRAY
Glass
INSULATORS

Edison Company Honors Late G. C. Ward

Commemorating the outstanding service of the late George Clinton Ward, construction engineer and former president of the Southern California Edison Co., ceremonies were held recently at Huntington Lake in Fresno County. A group of Edison executives and other friends of the builder dedicated in his honor a tablet marking the change of the name of Florence Tunnel to Ward Tunnel.

The tablet, on a base of granite, is at the outlet of the tunnel on the eastern shore of Huntington Lake. The tunnel is a vital unit in the company's $150,000,000 Big Creek-San Joaquin River hydro-electric development, the construction of which was under Mr. Ward's supervision.

In the Edison Company party were W. C. Mullendore, executive vice-president; R. V. Reppy, Will H. Fischer and D. M. Trott, vice-presidents; Henry M. Robinson, James R. Page and Ben R. Meyer, directors; Dr. G. L. Hoxie, economist; B. F. Fluno, comptroller; B. F. Woodard, assistant general counsel; R. G. Kenyon, advertising manager, and N. B. Hinson, chief engineer.

W. C. Mullendore delivered the main address on the dedicatory program. Other speakers included, Mrs. Louise Ward Watkins, prominent club woman and daughter of Mr. Ward, and Ralph Chase of Los Angeles, a director of the Sierra Club and companion of Mr. Ward's on early day trips into the Sierra.

Ward Tunnel is the crowning achievement of the development of the Big Creek region, which is located in the high altitudes of the Sierra Nevada mountains that define the San Joaquin Valley on the east. At the time of its construction the tunnel was the largest of its kind in the world. It was driven by drill and dynamite for thirteen miles through solid granite to connect Florence and Huntington Lakes, two large reservoirs in the Big Creek project.

Completed in 1925, after five years of continuous work, night and day, the tunnel has a diameter of 15 feet and a capacity of 2,500 cu. ft. per sec. The Big Creek development, begun in 1911, was completed in 1928. It supplies 532,172 horsepower of the Edison Company's combined hydro-electric and steam-electric generating capacity of 1,211,302 horsepower.

Mr. Ward was associated with the Edison Company for many years and was president of the organization in 1932 and 1933. He died in 1933.

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S. F. Sees Hope for Rejected Power Plan

That San Francisco might secure distribution of its Hetch Hetchy power over facilities of the Pacific Gas & Electric Co. without purchasing its own facilities at great expense and with probable duplication, again appeared as a possibility last week.

Two members of the Board of Supervisors observed independently that such a plan was exactly in line with a policy stated by President Roosevelt concerning joint use of transmission networks.

Secretary of Interior Ickes previously had rejected a proposal of joint use as being in conflict with the Raker Act. Commenting on this, a supervisor was quoted in the press as saying the rejection was that of Interior Department Solicitor Margold—"a young man who has nothing but a theoretical knowledge of law"—and not Secretary Ickes himself. The Supervisor urged San Francisco's insistence upon joint use of systems.

Meanwhile the number of plans under consideration by city officials has risen to seven. Plan 7, involving expenditure of $43,700,000 for a municipal distribution system has been favored by the Public Utilities Commission, but proposals for raising this sum have never passed the point of preliminary discussion. Similar proposals for creating public indebtedness previously have been defeated at the polls.

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• ANNEXATION of portions of Kings County, Calif., to the Central San Joaquin Municipal Utility District is being opposed in Hanford by a group known as the Kings County Landowners. A board of directors for the district will be elected at the general election in November.

Loadbuilding Theme of R. M. E. A. Annual Powwow

Emphasizing a belief in the necessity for aggressive load-building, the Rocky Mountain Electrical Association started its Fourth Annual Powwow at Santa Fe, N. M., Sept. 21-23, with an announcement of a campaign to sell 25,000 I.E.S. lamps between now and Christmas. Lighting, however, was not the only feature stressed by a program which did an unusually good job of coordinating the viewpoints of managerial, sales, engineering and accounting departments around the focal ideas of building more load and better service for the 150 representatives of the 32 member companies and other organizations who were present.

K. M. Robinson, President, Idaho Power Company, keynoted the loadbuilding theme of the program by describing the water-heating sales program on his system. It will produce at least 2,000 new water heating customers this year without seriously affecting system capacity because high frequency control is being installed on the more important distribution feeders to provide positive regulation of this load and keep it off the system peak. The national loadbuilding picture was presented by C. E. Greenwood, Commercial Director of the Edison Electric Institute who told of progress being made in the nation-wide drives in table cookery, kitchen modernization, lighting and others as well as the expanded plans for next year which will further stimulate the growing acceptance of the general public for modern, electrical appliances.

A fresh slant on the subject of loadbuilding was injected by G. B. Buck, General Commercial Manager of the Public Service Co. of Colorado who pointed out that loadbuilding was one of the responsibilities of rendering more adequate service, of building better public relations through selling greater utilization of electricity by consumers. It is the high usage customer that appreciates the low cost of electrical conveniences.

That the loadbuilding activities already in action are bringing results was indicated by the deliberations of the engineering committee. Reports covering a variety of problems were presented important among which were investigations of the adequacy of existing distribution circuits and methods of improving service economically in the face of rapid load gains. Of particular interest were the facts on engine competition presented by W. J. Kyle. Bylles-by Engineering and Management Corp., Chicago. The reports of this committee, of which A. H. Heitzler, Supt. of the Electrical Dept., Public Service Co. of Colo., was chairman, will be published in succeeding issues of ELECTRICAL WEST.

Informal session of the executive committee. Seated (left to right): K. W. Kissick, manager of Trinidad Electric Transmission, Railway & Gas Co., R.M.E.A. president; O. B. Summers, manager, New Mexico Power Co., and George Gadsby, president, Utah Power & Light Co. Standing: George Lewis, R.M.E.A. secretary

Other guest speakers included George Gadsby, President of the Utah Power and Light Co., and C. A. Davis, attorney for the Western Public Service Co., of Scottsboro, Neb.

Tying in with the Association's Fall I.E.S. campaign, J. L. Stair, Chief engineer, Curtis Lighting, Inc., presented an illustrated lecture on lighting progress and gave a glimpse of future developments. The patio of the La Fonda hotel, Convention Headquarters, was decorated with 12-ft. replicas of I.E.S. lamps built to exact scale and using 1,000-watt lamps.

A feature of the Powwow was the presentation of the American Trade Association award to RMEA's president, K. W. Kissick, by Clyde Tingley, governor of New Mexico. The award was made to those organizations of the country who have a record of outstanding service to business and the general public. The RMEA was the only electrical association so honored. Also of interest was the formation of the Electrical Pioneers, an organization within the Association composed of men having more than 25 years of service in business to promote good fellowship within the industry and to maintain progressive ideals in public service.

G. B. Buck, junior past president of the Association was recipient of the 1936 Award of Merit presented annually by the Association in the form of a diamond-studded gold medal. Officers elected for next year are Guy Faller, vice-president, Public Service Co. of Colorado, president; with A. H. Heitzler, O. B. Summers, New Mexico Power Co., Santa Fe, J. H. Jacobucci, Utah Power and Light at Green River, Wyo., as vice presidents, and W. C. Sterne, Public Service Co. of Colorado, treasurer.

Gaylord B. Buck, recipient of the association's 1936 Award of Merit, a diamond-studded gold medal. Looking on are Art Prager and K. W. Kissick, Association president

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• REFRIGERATION DEALERS in Seattle will operate without restrictions as the result of the city council's rejection of a proposed regulatory measure. If passed dealers would have been required to pay a $25 per year license and to post $600 bond. Journeymen would have been rigidly examined and subject to a $2 annual fee.

"IT HAS BEEN A GODSEND!"

—says Mrs. Bugden, R.N., of Madison, New Jersey.

"It's not what we say—It's what the customer says that counts!"

WESIX ELECTRIC HEATER COMPANY

SAN FRANCISCO, LOS ANGELES, SEATTLE

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Whether it's swampy, rocky, sandy or clay-whether the load is light or heavy - regardless of conditions - there's a Chance anchor that will do the job easily, economically and permanently.

Naturally, you can do a better, quicker, more economical job with the right anchor. To help you in making your anchor selections for each job we have published "Correct Anchoring". Send for copy.

Chance anchors are distributed by leading electrical wholesalers everywhere.

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CENTRALIA, MISSOURI.

World Power Conference Settled No Problems

(Washington Correspondence)—Dignified to the end, the Third World Power Conference and Second Congress of the International Committee on Large Dams ended its formal deliberations in Washington with the advantage, in the opinion of those few observers who could be called impartial, distinctly on the side of the privately-owned utilities.

With the embattled New Deal facing an election, and the beleaguered utilities fighting it on many fronts, the temptation to stage a bitter battle was tremendous. That acrimony was avoided and the proceedings kept upon a dignified basis is a tribute to both the management of the conference and to those who participated.

Nor does this mean that the pros and cons of public ownership were ignored; on the contrary, much of the information contributed by the foreign delegates dealt directly with the regulation, control, and ownership of power facilities by their governments. No formal conclusions were reached—the conference functions as an exchange of information, not as a policy-making body—but the net result of the week of discussion may be summarized in the statement that all-government administration of power resources lacks the vital spark of initiative; untrammeled private development fails to consider social and economic considerations inseparable from the power picture, though not reflected in normal accounting of profits. Somewhere between these extremes lies the golden mean, but its precise location was left undefined. Also unsettled was the best method of governmental supervision—whether by regulation or by competition, though the latter principle had few friends among the foreign delegates.

Net result of the conference, from the American viewpoint, was few conversions but much food for thought. It was startling to learn how many overseas peoples find their utilities and their governments in complete accord, rather than at loggerheads. True, this is partly due to a greater degree of submission to governmental intervention, but it is also due to more adroitness in imposing the yoke, and more consideration of the problems and aims of private management and to a desire to preserve, rather than stifle, private initiative.

Two statements by President Roosevelt in his power conference speech brought immediate rebuttals from utility executives. Phillip H. Gadsen, chairman of the Utility Executive Committee, challenged the President's statement that "additional meritorious projects awaiting development" can be undertaken. Mr. Gadsen said:

The President's assertion to the effect that, should the competitive influence of more federal dam projects be necessary to force further reductions of electric power rates upon private enterprise, then additional "meritorious" dams "can always be added", is a clear-cut admission of New Deal guilt in the abuse of Constitutional functions for the purpose of achieving unconstitutional objectives.

From the lips of the President of the United States, at last, we have an open and an official declaration that the real purpose of this hydro-electric program of the government is not flood control, not navigation, not conservation, that the real purpose is to force further reduction of electric power rates.

No other interpretation can be placed upon the President's words than that the recent official emphasis upon navigation, flood control and conservation are but a Constitutional smoke screen cloaking the unconstitutional federal power program.

The statement before the Supreme Court by Mr. Stanley Reed, New Deal Solicitor General of the United States, arguing the Wilson Dam-TVA case last winter, is pertinent. Said Mr. Reed:

"If we assume that this Act"—the TVA Act—"was primarily for navigation, then it would be valid. But if we determine that this Act, while stating that it is for navigation, national defense, and flood control, is actually for the purpose of developing power and selling it commercially, the Act would be invalid." (Emphasis mine.)

It is significant that the President, while making his first campaign year defense of his yardstick theory, failed to answer or explain the substantiated charge that electricity sold from these wasteful and unnecessary projects costs the people much more than the same energy if sold by the private utilities, any ostensible saving by way of lower rates being made up two-fold from taxes levied on everybody.

He has served notice upon the millions of citizens whose savings are invested in operating utility companies that, unless rates are adjusted to suit the arbitrary views of Washington bureaucrats, then the properties in which they have invested their savings are going to be subjected to further destructive and unconstitutional federal competition.

The President's reference to the twenty-five year old observation of Charles P. Steinmetz concerning the cost and use of electricity brought the following rebuttal from Charles W. Kellogg, president of the Edison Electric Institute:

In addressing the Third World Power Conference in Washington on September 11, the President quoted an observation made years ago by Charles P. Steinmetz to the effect that "Electricity is expensive because it is not widely used and it is not widely used because it is expensive." The President added: "That observation still holds true."

The facts are as follows: Steinmetz's observation was made in 1911 (in a lecture to students of the New York Electrical School). In that year the average annual energy consumption per residence customer in the United States was less than 260 kw.-hr. and the average price paid by residential consumers was 9.43c per kw.-hr.

For the 12 months ending July 31, 1936, the average annual residential energy consumption had risen to 701 kw.-hr., an increase of 170 per cent over the time when Steinmetz made his comment and the average residential rate had dropped to 4.84c.

This process continues month by month due to the effect of the inducement rates now practically universal in this country, and conceived and put into effect by the private electric industry some years before the New Deal was heard of, whereby each customer automatically gets a lower average rate as he increases his energy consumption.

Perhaps the best proof that the conditions cited by Steinmetz no longer exist is found in the voluntary action of the American people in the premises. During the last four years (with the last third of 1936 estimated) 6,000,000 electric refrigerators have been purchased in this country. This is in direct competition with the ice box so that no monopoly was involved in this great movement, merely the individual conviction in each case that at the rates available the electric way was the best and most economical.

In view of these results, which could be amplified by many other figures, the electric industry feels that it has long ago effectively broken the "vicious circle" which Steinmetz described in 1911.

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YOUNGSTOWN "Buckeye" CONDUIT, from ore mine to shipping platform, is the product of a single organization.

At no step in the process is there an opportunity for deviation from the rigid standards, maintained for more than thirty years, on which the "Buckeye" trademark has built its well-earned popularity with contractors, architects and building owners.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels
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Sheets; Plates; Tubular Products; Conduit; Tin Plate; Bars; Rods; Wire; Nails; Unions; Tie Plates and Spikes

First step in the manufacture of BUCKEYE Conduit . . . . making steel in a Bessemer converter.

BUCKEYE TRADE MARK YOUNGSTOWN CONDUIT

HOT GALVANIZED ELECTRO GALVANIZED

BLACK ENAMELED

Utah Power & Light Reduces Rates

New schedules incorporating rate reductions aggregating $200,000 per year in domestic and commercial lighting rates have been filed by the Utah Power & Light Co. as the result of an order by the Public Service Commission issued Sept. 8. Effective date of the new schedules was Sept. 30.

The new rates were ordered by the commission pending final determination of a rate case which has been under way for more than a year. The commission's order called for additional reductions on April 1, 1937.

The lower rates incorporate a reduction from 7 to 6 cents per kilowatt-hour on the first 75 kw.-hr. in excess of the minimum of 11 in cities of over 15,000 population and a reduction from 8 to 7 cents in all territory outside the three largest cities. Comparable reductions are made in commercial lighting rates.

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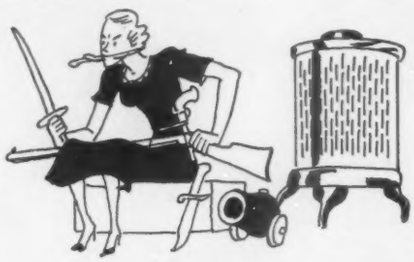
• A 40-MILE LINE in Bonner County, Idaho, was energized last month, serving 250 customers. Built with REA funds, it was constructed by a Spokane contractor for $41,244.55. Planned under a new allocation of $119,000 is an addition of 103 mi., to serve 445 additional customers in the county.



"... IT IS MY MOST PRIZED POSSESSION"

—says Edna Sterling, R.N., of Cincinnati, Ohio.

"It's not what we say—It's what the customer says that counts!"

WESIX ELECTRIC HEATER COMPANY

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The longer life and lower maintenance cost of *Crapo* Galvanized Steel Strand and Wire are matters of record with many of America's leading utilities. Time and again, these dependable products with their heavy, *pure* zinc galvanized coatings, have demonstrated their ability to resist corrosion far beyond the normal period of replacement.

That is one of the reasons why utilities from Maine to California now specify *Crapo* Galvanized Products on all new and replacement work.

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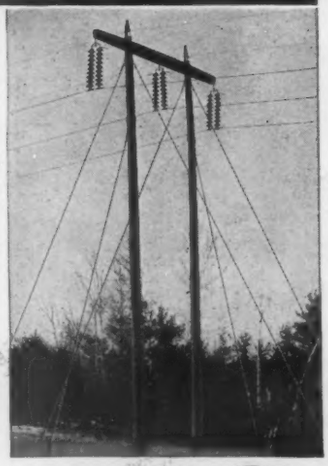
Muncie, Indiana



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Steel Strand

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Telephone and Telegraph Wire

Typical installation of Cumberland County Power and Light Co., Portland, Maine. *Crapo* Galvanized Seven Wire Steel Strand used for guying.

Marin Joins Counties Passing Ordinance

MARIN COUNTY, north of San Francisco, is the latest county to pass a county electrical inspection ordinance as recommended by the Pacific Coast Electrical Bureau, according to Frank Kieter, manager Northern California district. With Marin County the number of counties in California having such an ordinance now numbers four and includes Los Angeles, Orange, San Mateo and Marin Counties. San Francisco City and County likewise operates under an ordinance, although not one patterned after that of the Pacific Coast Electrical Bureau.

Likewise, the number of cities operating under the Standard Electrical Code recommended by the Bureau now includes the following cities:

Alhambra, Balboa, Beaumont, Carmel, Claremont, Coalinga, Colton, Davis, Grass Valley, Gustine, Laguna Beach, Madera, Mill Valley, Tulare, Ontario, Ventura, Santa Maria, Santa Rosa, Vallejo, Bakersfield, Brawley, Calexico, Coronado, Fresno, Glendale, Inglewood, Lynwood, Bell, Newport Beach, Petaluma, Redlands, Sausalito, San Rafael, San Bruno, Stockton, Riverside, Banning, Taft, Maywood, Santa Ana, Orange, Southgate, Oxnard, Lindsay, Manteca, Modesto, Monterey Park, Pasadena, Pomona, Porterville, Santa Monica, Visalia and Whittier.

An ordinance controlling the sale of appliances and prohibiting the sale of substandard and unsafe appliances as recommended by the Pacific Coast Electrical Bureau is also in effect in the following cities:

San Francisco, Burlingame, Glendale, Fullerton, Los Angeles, Lindsay, Southgate, Oxnard, Berkeley, Long Beach, Mill Valley, Santa Ana, Santa Barbara, San Diego, Orange and Tulare.

●

• NEGOTIATIONS FOR DELIVERY of Boulder Dam power to the municipalities of Burbank and Glendale, Calif., by the Los Angeles Bureau of Power and Light were completed Sept. 21. Supplemental contracts similar to one signed last year with Pasadena, outlining provisions for transmitting the two cities' allotments of Boulder Dam power, were signed by the Board of Water and Power Commissioners. The contracts supplement agreements signed in 1931.

●

• TO ELECTRIFY 470 farms in the San Carlos Irrigation and Drainage District of Florence, Ariz., the Rural Electrification Administration has allocated $145,000. Construction of 124 miles of line will permit delivery of current for pumping and cooking in the area where wind and fuel are scarce. Current for the REA project will be purchased from the Indian Service at about 4 mills per kw.-hr. Of the proposed consumers, 100 will live on resettlement farms, 100 on the Pima Indian lands at Sacaton.

Where IGNORANCE *means* MISS...

YOU MISS MANY A SALE BY SAYING, "I DON'T KNOW." DO YOUR SALESMEN KNOW ALL THE ANSWERS ABOUT MONEL METAL?

HOW many of these fine ranges are on your floor right now? Some of them—perhaps all. And you have other famous makes, topped with that lustrous-as-silver but tougher-than-steel Nickel alloy, Monel Metal.

Give your Monel-topped ranges the spotlight on your floor . . . they'll pay their way, and more. But—get your salesmen all set to answer your customers' questions about Monel Metal.

We have all ready to send you, your FREE copies of "Questions and Answers" on Monel Metal. Women the country over are interested in Monel Metal. Big space national advertising has seen to that. And when they ask your salesmen questions about it, it just doesn't do to fumble for an answer.

Two kinds of questions you get from prospects: "*What* does Monel Metal do?" and "*Why?*" Not so many of the first, for women know the answers. They *know* Monel cannot rust, cannot crack, chip, or peel. That it's solid, and that it grows ever more beautiful with use.

But Monel's abilities are so outstanding that it's natural they want to know "why." You increase their interest in Monel—and that means in your ranges, remember—by having the answers ready. You can even hand out some of these "Questions and Answers" cards to prospects.

Send in the coupon today for all you'll need . then group your Monel ranges together and watch 'em draw the crowds.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET NEW YORK, N. Y.

Monel Metal is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. Monel Metal is mined, smelted, refined, rolled and marketed solely by International Nickel.

MONEL METAL

MONEL METAL
for
Household Work Surfaces
(Tables, Ranges, Sinks, etc.)

Questions and Answers:

Q. What is Monel Metal?
A. It is a solid metal—an alloy composed of ⅔ Nickel and ⅓ Copper.

Q. Where does it come from?
A. From mines in the Sudbury District of Canada. After the ore has been purified by a preliminary treatment in Canada, it is shipped to the Huntington plant in West Virginia where it is refined and rolled into sheets, rods, bars, tubing, etc.

Q. Is it a new metal?
A. No—it is 30 years old. It was put on the market in 1905, but was not used extensively in the home until about 1930.

Q. You say Monel Metal is 30 years old—where has it been used? I never heard of it until about 5 years ago, when your advertisements started to appear.
A. It was hidden away in industrial plants, where it is used for Acid Pickling Crates in steel mills; for Pump Shafts in pumping Acids such as Sulphuric Acid; for Mixing Vats in Dye Plants, Textile Mills, Soap Factories; in Salt Plants; for Motor Boat Shafts; for Work Tables and Sinks in Hotel Kitchens and Restaurants; for Vital Parts of Railroad Signal Equipment; for Steam Turbine Blades; in Commercial Laundry Machines; in other machinery. In fact, any place where a tough, strong, acid and alkali-resisting, beautiful metal is required. The industrial record of Monel Metal is proof of its superior qualities for household use.

Q. Does it rust?
A. No. Being composed of Nickel and Copper and containing only about 1% Iron, it cannot rust.

Q. Does Monel Metal stain?
A. Not permanently. Fruit juices or milk, if left on it for long periods, may discolor it, but—the discoloration is easily removed with ordinary household cleansers like Bon Ami, Old Dutch Cleanser, Babo, etc.

[illegible] Monel Metal scratch? [illegible] perhaps, a diamond? But [illegible]

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EWt 10-36

"Imperial," by General Electric Co., with Monel Metal top and Inconel "Calrod" Heating Units.

The Westinghouse de luxe range "Emperor" with Monel Metal top.

"Mayfair," Electric Range by Hotpoint, with Monel Metal top and Inconel "Calrod" heating units.

Pacific P. & L. Announces New Low Rates

Rate reductions averaging 7 per cent and estimated to save customers $100,000 annually have been announced by the Pacific Power & Light Co. in Oregon, through Frank C. McColloch, State public utilities commissioner. Principal towns affected are Astoria, Bend, The Dalles and Pendleton.

Simplification was achieved. For example, twelve power schedules in Deschutes County were replaced by one schedule applicable to all classes of industrial power. In the commercial schedule, the reduction was principally in the top steps. In residential schedules both top and bottom steps were reduced, with a 2c bottom for all residential service.

Hood River domestic rates are typical of the reductions, formerly at 38 kw.-hr. at 7c with the excess at 3c, they are now 15 kw.-hr. for $1, 23 at 6c, 112 at 3c, excess at 2c.

Flat rate water heating was made non-applicable to new business, which will be taken on the 8-mill off-peak rate.

•

• DEATH OF A 5-YEAR-OLD BOY, Richard S. O'Leary, in Spokane, caused by his establishing contact between a defective lamp and a radiator in the O'Leary home, has led the city council to consider an ordinance requiring inspection of home electrical equipment. The lamp which caused the fatal accident was not an I.E.S. lamp and was found to be inadequately insulated when manufactured.

•

• THE PUBLIC UTILITY DISTRICT question in Lincoln County, Wash., will be submitted to voters at the November election. Balloting on the question follows a decision of the State supreme court, which recently overruled a restraining order granted by a superior court to the Washington Water Power Co., preventing the county commissioners from placing the proposal on the ballot. The supreme court said all questions raised in the case were foreclosed by a previous division holding the District Power Bill to be constitutional.

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Mountain States Co. Reduces Rates

Reduction in commercial and residential rates affecting 25,000 Oregon customers of the Mountain States Power Co., Albany, Ore., was announced last month by Frank C. McColloch, State public utilities commissioner. The Willamette valley, Coos Bay and Tillamook divisions of the company in Oregon were affected, principal cities being Albany, Corvallis, Tillamook and Marshfield. Reductions averaged 12½ per cent, and amount to $75,000 annually.

Following the Commissioner's practice, the new rates were arrived at by conference with company officials and were filed and accepted without public hearings.

Commercial schedules were reduced 1c in each step. Residential schedules were consolidated into one combination rate covering all service, but varying in the three divisions. In the Willamette division, the rate for residential service was 30 kw.-hr. at 8c, with all over at 3c. The new rate is 34 kw.-hr. at 7c, the next 116 kw.-hr. at 3c, and the balance at 2c. In all divisions a new bottom step of 2c is established.

Rural customers benefit by permission to install motor equipment up to 7½ hp. instead of 3½ as formerly.

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• THE ELECTRIC CLUB of Washington was represented at the annual Puyallup Fair last month with a booth displaying electrical devices, laying emphasis on farm equipment and lighting. Tom S. Wood was chairman of the club's fair committee.

New Unit

This fall Graybar opened its new building at First and Market Sts., San Diego. Service to wholesale buyers, including ample parking facilities, quick counter service, and a delivery system planned to place items where and when they're wanted, is under the managership of Robert T. Redfield, who was appointed to the San Diego post early this year

FOR
- *Lasting Economy*
- *Strength*
- *Safety*

USE LOCUST PINS
Oak Brackets and Pole Steps

LOCUST PIN CO. FRONT ROYAL, VA.

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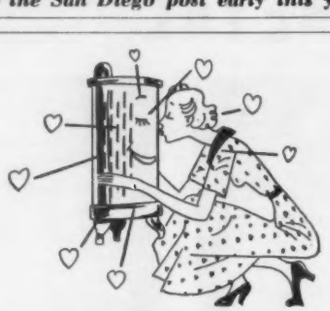

... SO CHEERFUL I LOVE IT
—says Mrs. O. McCall, of Tacoma, Washington.
"It's not what we say—It's what the customer says that counts!"
WESIX ELECTRIC HEATER COMPANY
SAN FRANCISCO, LOS ANGELES, SEATTLE

Distribution Cost Study Released by F.P.C.

Surveying and investigating the distribution systems and records of 22 private and municipal electric-utility systems, a report entitled "Cost of Distribution of Electricity" has been issued by the Federal Power Commission. The report was made in compliance with Senate resolution No. 80 and President Roosevelt's executive order No. 6251 directing a survey of the nation's power resources, including a study of the transmission, distribution and utilization of electric energy.

Systems were selected in various localities and continuous studies made of all the elements that enter into local distribution for urban or rural territory or both. The report reflects a wide variety of service conditions which may not be considered either typical or average for the whole country. Among those were: private and municipal operation in large and small communities and rural districts; competitive and non-competitive situations; overhead and underground types of construction and varying climatic, topographical and other physical conditions.

Among the communities studied were several in the West including Los Angeles, Seattle, Portland, Tacoma and Pasadena, together with 24 cities in extensive rural areas served by the San Joaquin Light and Power Corp. and the rural territory served by the Molalla Electric Co. in and around Aurora, Ore.

The lowest distribution system investment per customer in any of the communities studied was $45.18 at Lewisburg, Pa. The highest figure was $117.99 for the Puget Sound Power and Light Co. at Seattle, where under competitive conditions a distribution system covering the entire city area with sufficient capacity to supply practically all residential customers has been built. Other systems influenced by competition include the Seattle municipal system with a customer investment of $81.43; Los Angeles Bureau of Power and Light with $81.46; and the two systems in Portland, Ore., with $68.34 and $95.90.

Combining fixed charges on the investment per customer with the taxes and operating costs per customer was used to give the annual cost of distribution in dollars per customer per year. Applying a 6 per cent return figure the lowest costs were $9.92 in Springfield, Ill. Tacoma, Wash., had a figure of $12.89. The highest figures were $29.12 for the Puget Sound Power and Light Co. and $22.85 for the Northwestern Electric Co.

Expressed in cents per kilowatt-hour for each system, obtained by dividing the annual cost per customer by the corresponding average annual usage of energy per customer, the study shows the Tacoma municipal system with the lowest cost of 0.85 cents per kilowatt-hour. The Portland General Electric Co. has a cost of 1.38 cents and the Seattle municipal system 1.57 cents. Owing to the high customer usage all western cities and systems showed up well in this classification.

The report also contains figures on both commercial and industrial service.

Excluding the rural areas adjacent to larger communities where customer density is high, the lowest distribution investment per rural customer was $150.46 for the Molalla Electric Co. with San Joaquin Light & Power Corp. second with $197.60. Annual cost of distribution was $27.40 for the Molalla Electric Co. and $36.40 for the San Joaquin Light & Power Corp., again using the 6 per cent return basis. These figures give a cost per kilowatt-hour of 4.06 cents for the Molalla company and 2.39 cents for San Joaquin.

The study consisting of 148 pages is known as "Power Series No. 3" and is obtainable from the Superintendent of Documents at Washington.

A SAFE BET IN TYPE "D" SWITCHES

THE NEW COLT-NOARK "Pony" SWITCHES

. . . front operating switch mechanism . . . handsome cabinets

Catalog No. 76

Above is Catalog No. 76 . . . 30 amp. 2 Plug fuse, furnished with fibre dead front plate. Large Illustration at top is Catalog No. 83 . . . 30 amp. 2 H.E.C. fuse. Catalog No. 73 shown closed.

The NEW COLT-NOARK 100th ANNIVERSARY CATALOG is ready. Contains full data on new Pony Switches—as well as all Colt-Noark Products . . . send for your copy.

THESE new Colt-Noark Pony Switches will put you in the money on Type "D" Switch business — they're a safe bet for use wherever light duty equipment is required. Furnished in 30 and 60 ampere sizes . . . fitted with porcelain block for plug or cartridge fuses. Non-fusible also available.

The switching mechanism is actuated by two sturdy coil springs, producing quick-make and quick-break action. Longer life is assured by use of multiple break principle . . . reducing arc to a minimum. Cabinets are attractively designed with embossed covers. Operating handle is furnished in colorful red bakelite.

Lay your bets on these new Colt-Noark "Ponies" . . . send for complete information!

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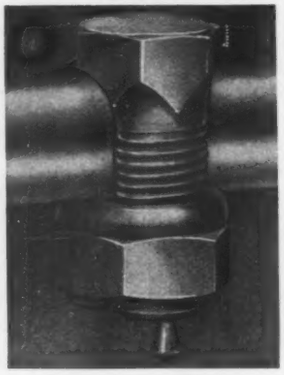

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Electrical Engineers and Manufacturers' Representatives
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Underground Transmission

Without Conduit

Note the air and moisture proof flexible coverings. Sealtite represents a distinct advance in parkway cable construction. It is more pliable than any other underground cable . . . and costs are considerably lower.

Write for booklet offering suggested uses and explaining long life.

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MAYDWELL & HARTZELL
INCORPORATED
ELECTRICAL ENGINEERS
and
MANUFACTURERS' REPRESENTATIVES
Los Angeles ★ San Francisco

• WOOD-CHIPPER DRIVE is a new operation successfully taken on by electricity, as proved by the installation made by the Sumner Iron Works at the Olympic Forest Products Co. The wood chipper is a heavy fly wheel carrying blades against which the butt of a log is forced. The blades cut the log into chips for use in pulp mill digesters. Because foundations in the usual pulp mill are poor, separate alignment of bedplates is difficult, with the result that chippers have been belt driven. Sumner Iron Works mounted a 300-hp. Westinghouse motor stator on the same bedplate with the chipper. The rotor was overhung on the chipper shaft, overall dimensions being reduced by the use of but two bearings.

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• PRELIMINARY WORK on Seattle City Light's Ruby Dam project on the Skagit River appeared imminent when J. D. Ross, superintendent of light, asked permission to construct 24 miles of road above the site of the proposed $13,000,000 dam and power plant.

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• A POWER DISTRICT in Okanogan County, Wash., will be voted upon at November elections. The proposition is to establish under the Grange power law of 1930, a district with authority to buy and distribute power, or to generate, distribute and sell.

• FIRST FARM HOME mutual lighting project of the Pacific Coast Rural Electrification Administration is that in the Tanner Edgewick district, east of North Bend, Wash. Thirteen miles of line will be constructed to electrify 60 farms. Other projects of the same type have been carried through in Washington, but on this one, the entire $13,000 was made available by the electrification administration.

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• TO BUILD HOUSES at Seattle City Light's Diablo Dam site on the Skagit River, the city council last month authorized expenditure of $106,000. To prepare for the erection of a 29-mile transmission line from the dam to Seattle, $11,680, to be matched by $87,695 in WPA funds, was authorized for clearing and grading.

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• CONSTRUCTION of another electrical home in Vancouver, this one by the Electrical Service League of British Columbia, has been announced. Not a "model" electric home, it will rather be an example of that which is within the reach of the average income. It will be fitted with the more essential appliances and the newest in lighting. Details are being prepared by R. Hall, secretary of the league.

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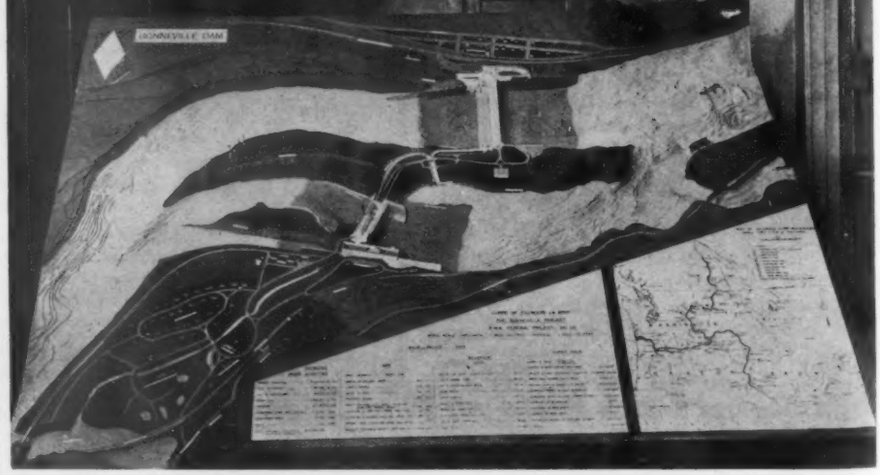
Model Shows Bonneville Details



U. S. Army Engineers prepared this model of the complete Bonneville project for display at the World Power Conference. It shows the power house structure and navigation lock between the Oregon shore and Bradford Island and the main dam between the island and Washington state. Initial power installation is two 60,000-hp. units out of an ultimate of ten. Generators are 50 ft. in diameter, operate at 75 r.p.m.

Federal Plants Protested In Imperial Valley

Protests against the use of federal funds for power plants in the Imperial Valley which would undersell the Boulder Dam power plant will be lodged with Secretary of the Interior Harold Ickes by at least two states of the upper Colorado River basin. Governor Henry H. Blood of Utah has asked other states concerned to participate in a joint protest.

Construction of these Imperial Valley plants, Governor Blood pointed out, would prolong the period of repayment for the Boulder plant. This, it is feared, would imperil the fund which the Boulder Canyon Act provides shall be built up out of excess Boulder Dam project revenues for the development of other parts of the river system.

Answering Governor Blood, Governor Ed C. Johnson of Colorado wrote that his State had already filed a preliminary protest with Secretary Ickes and had asked him to hold up action until investigations being undertaken by Colorado could be completed and a formal protest filed with supporting data.

Other states concerned are Wyoming and New Mexico.

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• PORTLAND ROTARY CLUB turned out 465 strong recently as guests of L. T. Merwin, President, Northwestern Electric Co., at a picnic supper and program at Ariel Dam on the Lewis River 40 miles north of Portland. A large amphitheater and picnic ground were prepared near the power house, and steaks were broiled electrically for the Rotary members and their wives. Entertainment was provided by a staff of KOIN, the radio station in Portland that has been broadcasting the company's weekly "Northwestern Neighbors" program. Paul B. McKee, President of Pacific Power & Light Co., is president of Portland Rotary.

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• MODERNIZATION LOANS under F.H.A. are still available until April 1, 1937. Such is the announcement of the Federal Housing Administration, pointing out that only the loans under Title 2 have been withdrawn since April of this year. The loans under Title 1 for modernization and upkeep of buildings and other forms of construction may still be made. These include the revamping of wiring systems in homes, stores or factories, and installation of permanently attached equipment such as air conditioning systems. The tremendous success of the F.H.A. loans in selling appliances indicates the possibilities which can still be developed in the wiring field through such loans.

• DOMESTIC LIGHT RATES in Seattle were cut 10 per cent Oct. 1, following the city council's endorsement of such a proposal by City Light Superintendent J. D. Ross. Eight thousand domestic customers will share in the $13,600 a month reduction. Under the new schedule, basic rates on the first 40 kw.-hr. are cut from 5 to 4½c. Puget Sound Power & Light Co. is expected to meet the reduction as it has met similar reductions in the past.

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• VOTERS OF PROVO, UTAH, will cast their ballots at a special election Oct. 13 on the issuance of $800,000 of revenue bonds for the purchase or erection of a municipal electric distribution system. The proposed plan contemplates the purchase of the distribution system of the Utah Power & Light Co., or, if this fails, the erection of a competing system.

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• REHEARING of the $228,700 valuation placed by the California State Railroad Commission on property of the Southern California Edison Co., Ltd., in Tulare county, last month was denied by the State Supreme Court. The court, in July of this year, upheld the 1933 evaluation, concerning the validity and fairness of which the company had brought suit.

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• VOLUNTARY RATE REDUCTIONS were announced by the Arizona Edison Co. last month effective in Globe, Miami and Yuma. Savings were estimated at $5,300 per year in Globe, $3,500 in Miami. Yuma savings were not estimated. Reductions in the first blocks were 1c, the rate for the first 30 kw. being 9c. The point where the 2c rate begins was changed from 1,000 to 1,400 kw.

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• FOR A RURAL LINE project in Goshen County, Wyo., the REA last month allocated $29,000. A non-profit corporation now being organized under State laws will sponsor the project. When completed, it will include 25 miles of lines serving 78 customers. Wholesale current will be purchased from the municipal plant at Lingle.

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• MONTHLY REPORTS on power production facilities of the United States, which since 1919 have been published by the Geological survey, are now being published by the Federal Power Commission. Maintenance of this record was delegated to the Commission by the Federal Power Act. Old subscribers will continue to receive copies as before.

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FIRST NATIONAL
BANK
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Member Federal Deposit Insurance Corporation

***YOU CAN MAKE QUICK PROFITS WITH FAST Selling* CLIFTON**

FRICTION TAPE
FRICTION CLOTH
AND SPLICING
COMPOUNDS

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ASSOCIATED SALES ENGINEERS
912 EAST THIRD ST., LOS ANGELES

ALBERT S. KNIGHT CO.
3006 WESTERN AVE., SEATTLE

COMPLETE STOCKS CARRIED AT
ALL 3 PACIFIC COAST POINTS

CLIFTON MFG. CO.
65 BROOKSIDE AVE., BOSTON, MASS.

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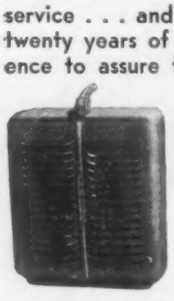
"OK" on every Thermador

ELECTRIC WATER HEATER

The merchant who stocks and features THERMADOR ELECTRIC WATER HEATERS has the advantage of knowing that a THERMADOR is approved by every utility in the West.

Central station approval is a grand selling point. It means that a THERMADOR is a quality heater, built to render a lifetime of uninterrupted service . . . and THERMADORS have twenty years of manufacturing experience to assure this service.



Presenting the "STREAMLINE" PORTABLE HEAT-FAN

A little giant in the field of heating. New beauty lines. Very light weight so that even a child can carry it. Turbine type that circulates warm air in the living zone or cool air in the summer.

For complete price lists of THERMADOR Water and Room Heaters, write the factory or nearest office. The electrical age has arrived and Thermadors are leading the parade.

Thermador Electrical Mfg. Co.

Factory: 2821 East Pico Blvd., Los Angeles
557 Market St., San Francisco
Builders Exchange, Fresno

...about People

W. L. Percey Dies In Pasadena

W. L. Percey, retired veteran officer of the Southern California Edison Company, died Sept. 21 at his home in Pasadena, following a prolonged heart illness.

Mr. Percey, who was a vice-president of the Edison Company at the time of his retirement from active service on Jan. 1, 1934, became identified with the electrical industry in Southern California in 1896. In July of that year he joined the West Side Lighting Company, predecessor of the Southern California Edison Company, as treasurer. The West Side Lighting Company operated Los Angeles' first steam-electric plant. Throughout the development of the electrical industry in the Los Angeles area, Mr. Percey held numerous important official positions with the companies which later became a part of the Edison Company organization. With the incorporation of the Southern California Edison Company, he was named treasurer of the concern, and became a vice-president in 1925.

Mr. Percey was born in Hoosic, New York, in 1865. He began his business career in New York state and later went to Philadelphia where he was connected with the Pennsylvania Railroad. He came to California in 1896.

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• A MEMORIAL to William Mulholland, builder of the Los Angeles aqueduct and pioneer of the Colorado River aqueduct, is being planned at Los Angeles. It is proposed to create a symbolic figure of the engineer on a mountainside in Pacoima Park in the San Fernando valley. In one hand of the proposed figure will be a transit, the other arm outstretched toward an artificial cascade to be built on the hillside.

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Pacific Power & Light Promotes D. B. Leonard

D. B. Leonard, formerly agricultural agent for Pacific Power & Light Co., Portland, has been appointed commercial manager of the company, effective Aug. 24 by George T. Bragg, general manager. The position is newly created to coordinate load building activities in the commercial, domestic and rural departments. Guy E. Davis, formerly merchandise manager, is in charge of domestic sales as domestic sales supervisor.

Mr. Leonard joined the company organization in 1929, after seven years of varied experience in agricultural development work. After graduation from Washington State College, he was associated with the U. S. Department of Agriculture. In 1925, he was with the University of Idaho extension service and later with the Washington State College extension service at Pullman, whence he joined the Pacific Company as agricultural agent to develop rural business. His headquarters have been moved from Walla Walla to the Portland office.

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Hubbard & Co. Appoints Arntzen to Northwest

Norman V. Arntzen, for the past six years a member of the sales engineering staff of the Pacific Coast Division of Hubbard & Co., has been appointed

NORMAN V. ARNTZEN

sales engineer for the company's northwestern district. W. W. Glosser, vice-president, announced the appointment effective the first of this month.

Mr. Arntzen will make his headquarters in Portland, confining his work to Oregon and Washington. Since joining the company in 1926, Mr. Arntzen has served in service, production and sales departments. Previously, he was a member of the administrative staff at the University of California, where he specialized in the design of research apparatus.

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William Grove Named Arizona Sales Manager

Appointment of Will H. Grove as general sales manager of the Central Arizona Light & Power Co. was announced last month. For the past several years he has been manager of the Public Utilities Consolidated Corp.

Well known in Arizona, he became affiliated there after service with several utilities in the East and Middle West. He is a graduate in mechanical and electrical engineering.

Sierras Power Makes Promotions

Heading a list of personnel changes by the Southern Sierras Power Co. in its Imperial Valley territory was the promotion of W. L. Bennington to the newly created position of commercial manager for the area. Joe E. King remains in charge of operations.

Succeeding Mr. Bennington as superintendent at Calexico and in charge of Mexican properties is Loyd Loudon, previously superintendent of the Holtville district. Wade S. Cook was promoted to Mr. Loudon's former post. The appointments were announced by Albert G. Cage, assistant general manager.

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• M. C. SMITH, president of the El Paso Electric Co., El Paso, Texas, has been named executive vice-president of the Virginia Electric and Power Co. after 5 years in El Paso. He is to be succeeded by R. S. Nelson who was president of the Baton Rouge Electric Company and also of the Louisiana Steam Generating Corp., all members of the Engineers Public Service Group of utilities. Mr. Smith came to El Paso from Baton Rouge Electric Co. in 1931 himself.

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• GEORGE W. ROUNDS, assistant traffic manager of the North Coast Lines, a subsidiary of the Puget Sound Power & Light Co., died at his home in Tacoma, recently. Mr. Rounds had been connected with the company for 35 years.

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• UPON THE RETIREMENT of H. S. Barber after 28 years of service with The Nevada-California Power Co., first as bookkeeper and in the last 13 years as chief clerk in the auditing department, J. A. Talley was appointed chief clerk in his place. Mr. Talley who has been with the company since 1924 has been traveling auditor of the material and supplies department and secretary of the routine committee. Paul Emerson has been made secretary of the routine committee, succeeding Mr. Talley. He has been employed as clerk in the property ledger section of the auditing department.

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• FRANKLIN D. HOWELL has been appointed to the Los Angeles Board of Water and Power Commissioners, succeeding A. F. Southwick, whose term expired. Following confirmation of his appointment by the Los Angeles city council, Mr. Howell was named by Dr. John F. Haynes, president of the commission, to serve as chairman of the employment committee and as a member of the public relations committee.

Vice Presidents in the Rough

State Chamber of Commerce business brought Bill Mullendore, vp. of Southern California Edison, and Earl Fisher, of Pacific Gas and Electric, together for a visit to the Idaho-Maryland mine recently where the electrical industry was forgotten for bigger concerns of state. As with the two governors, it is a long time between—pictures of this kind

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• D. M. JOHNSON of the B. C. Electric Railway Co. has been elected chairman of the Vancouver branch of the American Institute of Electrical Engineers. Election took place at the annual dinner, held recently, and Mr. Johnson will take over the duties of his new office on August 1. Other officers elected are: vice-chairman, E. G. Callwick, professor of electrical engineering, University of British Columbia; secretary, J. H. Steede, B. C. Electric Railway Co.; executive committee, W. D. Robertson, Canadian General Electric Co. and J. E. Underhill, B. C. Electric Railway Co.

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• DAVID G. TAYLOR, sales manager of the Gardner Electric Manufacturing Co., Emeryville, Calif., recently returned from a 3,800-mile trip through the Northwest and Intermountain states during which he appointed three new distributors for the Gardner line. The new Gardner representatives are:

Industrial Electric Co., 1304 Stewart St., Seattle, Wash., Langman Engineering Co., 1412 Northwest 14th Ave., Portland, Ore., and Modern Electric Co., 37 Richards St., Salt Lake City.

•

• C. C. HILLIS has been appointed vice-president in charge of sales for the Triangle Conduit & Cable Co., Inc., Brooklyn, N. Y. He will continue to operate in the Pacific Coast east to Denver.

METER and CONTROL Off-peak Loads with MODERN METERS

Sangamo Type HV-S-2 Two-rate Meter, Socket Mounting

Sangamo Type HV-A Meter and Time-Switch in "A" Base

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Western Offices:
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PHOENIX
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SAN FRANCISCO
1061 Howard St.
DENVER
1526 Blake St.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

• J. P. SCHAENZER, assistant director on the national Committee on the Relation of Electricity to Agriculture, just completed a five weeks' field study trip of the Pacific Coast. Touring the Northwest and California, where he made contact with agricultural departments of utilities and state agricultural colleges, Mr. Schaenzer, assistant to Dr. E. A. White, national director of the C.R.E.A., was great impressed with the West's outstanding accomplishments in the field of agricultural electrification.

Save Their Cost and Pay Dividends by—

1. Elimination of duplicate conduit runs.
2. Saving in power rate.

(Put all of your 110-volt equipment on a 220-volt or 440-volt power circuit, it is economical.)

JEFFRIES TRANSFORMER COMPANY
5706 Long Beach Ave. Los Angeles

PROFESSIONAL SERVICES

ELECTRICAL TESTING LABORATORIES
Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory.
80th St. and East End Ave., New York

ARTHUR R. KELLEY
CONSULTING ENGINEER
Reports and Valuations, Public Utility Industrial Properties
Edison Bldg. Los Angeles

• J. E. CRILLY has been appointed Pacific district manager of the General Cable Corp. The appointment of Howard E. Eagleston to general sales manager of the corporation, with headquarters in New York, made way for the change.

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• MAJ. K. CHARLES BEAN, U. S. Army Engineer Reserves, has been appointed by the Los Angeles Board of Public Utilities to succeed J. Ogden Marsh as chief engineer and general manager of the public utilities and transportation department. Maj. Bean has been successively assistant engineer of the California State Highway Commission, superintendent of construction for the Los Angeles municipal engineering department, and a member of the staff of Theodore Wyman, Jr., U. S. District Engineer.

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• BEN H. PARKINSON has joined the North Coast Electric Co. of Portland and Seattle, as sales promotion representative in Oregon and Washington for Norge appliances. He will make his headquarters in Seattle. Well known in the electric industry through long association with the Pacific Power & Light Co., Mr. Parkinson resigned the sales managership of the Portland Gas & Coke Co. to take the new position.

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• CARL I. WHEAT has been appointed associate counsel on the Federal Communications Commission inquiry into the affairs of the American Tel. & Tel. Co. He will be in charge of the rates and tolls section of the investigation. Mr. Wheat was formerly public utilities counsel for the city of Los Angeles, and also has served as attorney for the California Railroad Commission.

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• ARTHUR DAHL has been made district supply sales manager for the San Francisco district of General Electric Supply Corp., according to Charles Goodwin, district manager. Arthur Dahl has been salesman of supplies in the district for the past several years. Previously he was in business with his father as an electrical contractor.

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• C. E. BECKWITH has resigned as district manager for the Washington Water Power Co. to enter business for himself. Moving to McMinnville, Ore., he plans to operate a variety store under a franchise of the National Ben Franklin League.

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• R. E. DINSMORE, sales manager, the Norge Corp., has been a visitor to the Pacific Coast conferring with distributors of the Norge line of home appliances.

• AWARDS FOR SERVICE were last month made by Graybar Electric Co. to the following employees in the West: Clarence A. Martin, Seattle radio and telephone department manager, 20 years; Peter W. Todt, Los Angeles service manager, 30 years; Walter B. Tavenner, Los Angeles salesman, 25 years, and Cedric S. Carter, Los Angeles packer, 20 years.

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• L. L. GRIBBLE, sales manager of the Electrical Specialty Co., Inc., Pacific Coast manufacturers' representatives is on an extended Eastern trip visiting factories represented by the firm. He will not return to the Coast until November 1. Electrical Specialty Co. will move its San Francisco warehouse and offices from 1575 Folsom St. to 316 Eleventh St. about October 25, according to A. E. Buttner, vice-president and general manager.

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• OTTO J. EMME, one of the seven Los Angeles representatives on the board of directors of the Metropolitan Water District of Southern California, has been appointed as the district's special representative in all matters concerning the city council and the mayor of Los Angeles.

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• DON R. MCCLUNG, formerly assistant chief engineer of the Pacific Power & Light Co., Portland, has been made assistant to George T. Bragg, general manager. Mr. Bragg stated the position is a new one, created to expedite clearance of operating details through the general manager's office. Mr. McClung joined the Pacific Power & Light Co. organization as a draftsman in 1917, following his graduation from the University of Washington, with the exception of a short period with the Phoenix Utility Co., until Feb. 1, 1926, when he was made chief draftsman, a position he held for ten years. On June 16, 1936, he was named assistant chief engineer.

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• NANCY FINCH, home service director of the Utah Power & Light Co., and Louise Espey, home service director of the Northwestern Electric Co., were among the speakers on the program of the fifth annual home service conference held by the Edison General Electric Appliance Co. at Chicago recently.

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• H. E. BEANE, field sales manager of the Bristol Co., Waterbury, Conn., is visiting the Pacific Coast Bristol offices. In the course of his trip he planned to open a new sales and service office in the Northwest in addition to the service laboratory and assembly plant now located in San Francisco.

..about the Trade

Planes Speed U. S. Sales Tour

Extent to which modern transportation and communication facilities smooth the way for the salesman was demonstrated last month in the case of C. A. Russell, sales manager of Wesix, Inc., who visited the twenty-one major market cities of the U. S. in 21 days, transacting business in each one.

Using planes exclusively and advising customers by telegram of his intended arrival, Mr. Russell traveled from San Francisco to Boston, stopping en route, then flew down the Altantic seaboard to Florida, returning to the Pacific Coast via the Southwest. Most exciting moment of the trip was when a trimotor plane operated by a small line in Florida ran out of gas and landed in a small emergency field some 60 miles short of its destination.

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• NAME OF THE Byllesby Engineering and Management Corp. has been changed to Public Utility Service Corp. by the board of directors. B. W. Lynch has been elected president of the new corporation succeeding the late John J. O'Brien. The new corporation will continue to render engineering and managerial services to public utility companies comprising the Standard Gas and Electric system. Members of the board of directors of Public Utility Service Corp. consist of the presidents of the operating companies and include the following from the Far West: C. M. Brewer, The California Oregon Power Co. and Mountain States Power Co.; W. F. Raber, San Diego Consolidated Gas & Electric Co.; W. N. Clark, Southern Colorado Power Co.

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• L. W. THOMPSON, 912 E. Third St., Los Angeles, has been appointed southern California and Arizona distributor for the Electric Power Equipment Corp. of Philadelphia.

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• Grays Harbor Railway & Light Co. is again publishing its magazine, The *Syncronizer*. Suspended in depression years, issues in Volume 7 appear carrying the caption, "published by and for the employees."

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• SUNSET ELECTRIC CO., distributors in Portland, Ore., recently moved to expanded quarters on Northwest Tenth and Glisan Sts. across the street from their former location. Feature of the new quarters is an enlarged display room where the complete line of Frigidaires, L & H ranges, Easy washers and ironers, Philco radios and air conditioning equipment is on display, according to A. L. Shellworth, manager.

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• GOOD HOUSEKEEPING SHOP, of Vancouver, Wash., plans to move into new quarters this fall, according to Don Rogers, manager. The new store is to include a complete Westinghouse model kitchen and will feature a kitchen planning service.

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• SANTA BARBARA division of the Southern California Edison Co.'s Women's Committee won first rank for the group having 15 members or less and the Santa Ana division won first rank for those having over 15 members in the awards for the best yearbook and record of year's accomplishments. F. L. Greenhouse, B. F. Woodard and W. C. McWhinney were judges of the yearbooks. The Women's Committee has already started on a new year's program including a strong loadbuilding assistance activity, public relations, education relative to the industry, safety first, individual development, benevolence and library work.

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• IN A NEW AIR CONDITIONED STORE at 1034 Fulton St. the Federal Outfitting Co. at Fresno has gone into the electric appliance field with the same strong selling emphasis as it has always carried in the clothing business, originally its sole concern. The air conditioning installed is of Westinghouse make. Appliances featured are Hotpoint refrigerators, Apex washers and ironers, Zenith radios and Motorola auto radios. The Fresno Bee carried a special Federal section to inaugurate the opening of the new store Aug. 21.

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• MAIN ELECTRIC CO., of Pocatello, recently remodeled the wiring at the Pocatello public library. New Westinghouse units which will accommodate 500-watt lamps were installed with a present wattage of 300 watts providing a light intensity better than 25 footcandles over the entire library.

•

• STERLING ELECTRIC SHOP, San Fernando, Calif., has doubled its store space in moving to 125 N. Maclay Ave. The offer of a towel to any woman who would come into the shop and iron it on an ironer was so successful that all towels available for sale by San Fernando stores were used up.

•

• MODERN ELECTRICAL Service is a newly opened electric shop at 5936 Atlantic Blvd., Maywood, Calif., equipped to condition all types of motors.

LAPP
LINE POST INSULATORS

Lapp Line Post Insulators eliminate radio interference due to both dirt and electro-static conditions.

★

Write for Bulletin No. 123 describing and cataloguing these insulators.
LAPP INSULATOR CO., Inc.
Le Roy, N. Y.

Los Angeles — MAYDWELL & HARTZELL INCORPORATED — San Francisco

★ *Electrical Engineers and Manufacturers' Representatives* ★

"... I FOUND IT A PERFECT TREASURE!"
—says Mrs. L. J. McFarlan, of Darlington, South Carolina.

"It's not what we say—It's what the customer says that counts!"

WESIX ELECTRIC HEATER COMPANY
SAN FRANCISCO, LOS ANGELES, SEATTLE

MAYDWELL

Glass Insulators

All Standard Numbers
For All Purposes

Made of high quality materials in a modern Pacific Coast plant producing an unusually tough glass to withstand all severe service conditions.

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Electrical Engineers and Manufacturers' Representatives

Los Angeles ★ San Francisco

From a box two feet square

you can fit any range with CHROMALOX Super-Speed RANGE UNITS

Power companies and electrical dealers everywhere are cutting inventories to the bone by standardizing on one unit for replacement service in all ranges. One-call service completes any job, makes gratified customers, and gives you easy profits. Get the unfailing Sales Plan from our nearest representative or write us direct.

EDWIN L. WIEGAND CO.
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Represented by
MONTGOMERY BROTHERS
911 Western Ave., Seattle, Wash.
1501 N. W. Kearny St., Portland, Ore.
61 Fremont St., San Francisco, Calif.
912 E. 3rd St., Los Angeles, Calif.

THE PETERSON COMPANY
1921 Blake St., Denver, Colo.

• SHERMAN CLAY & Co., music and appliance dealers of San Francisco, has been carrying on an extensive remodeling program at each of the company's stores. The main office store on Kearny and Sutter Sts., San Francisco, as well as the branch stores in several sections of San Francisco, in San Jose and Sacramento are likewise being remodeled in a modern trend. Appliance and radio displays will particularly feature the new floor plan arrangements at each store.

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Landmark

Black letters on an illuminated background make this sign on the B. C. Electric Co. store in Vancouver catch attention despite distraction of other signs on the lighted street. It was designed in the power company's publicity department. Concealed Neon and incandescent units light the background from behind the letters, while five concentric rows of visible Neon tubes add modernism. Background illumination is alternately white and blue

• GREY ELECTRIC SUPPLY Co., San Francisco, has announced the appointment of Walter S. Olson as a lighting specialist in the San Francisco Bay area.

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• BRETTELL LTD. is the title sought by the Brettell Distributing Co. Ltd., long established electrical wholesaling house of Vancouver, in an application for permission to change its name.

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• H. J. WISMER became the twelfth air-conditioning dealer in Sacramento when he established at 1305 Eighth St. An installation on his sales floor is an aid in his demonstrations of his line—P&R Coolerators, manufactured by Pernot & Rich Co., Los Angeles.

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• ALLIED MANUFACTURERS, LTD., managed by R. F. Whitehurst, is the newest member of the Western Furniture Exchange in San Francisco. Included in their lines of home appliances are Dayton refrigerators, Barton washers and ironers, Cadillac vacuum cleaners and Case radios.

•

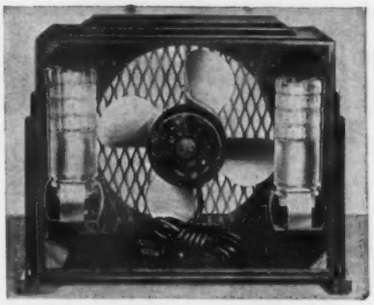
• GIL BRAGG has opened a new home appliance shop in Fresno at 1149 Van Neses Ave. Appliance salesman for the past 5 years in the Fresno territory, Mr. Bragg has opened a unique shop in which there is no front, no door and no windows. Using the open market idea, Mr. Bragg has the entire front of the store open so that passersby can walk in as though it were a continuation of the sidewalk. Doors can be lowered at night to lock up the store. With a friendly advertisement Gil Bragg invited all of Fresno to the open house on the day of his opening Aug. 1, featuring Stewart-Warner radios and refrigerators, York portable air conditioners, Speed Queen washers, Simplex ironers and Kleenfire circulating oil heaters.

"...IT IS SO FAR AHEAD OF THEM ALL THAT I DON'T SEE HOW THE OTHERS HAVE A CHANCE"
—says Mr. W. N. Sturges, of Chicago.

"It's not what we say—It's what the customer says that counts!"

WESIX ELECTRIC HEATER COMPANY
SAN FRANCISCO, LOS ANGELES, SEATTLE

...in New Equipment



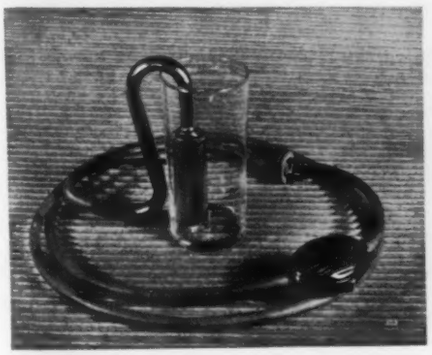
Fan in Cabinet Deodorizes

Deodorizing vapors are circulated by a fan announced by Ira E. Baker Co., Cleveland. Priced to compete with conventional fans, it is available in 8- and 10-in. models. Liquid deodorants are carried in two bottles and dispensed through Vacutop closures, produced by Double Duty Products, Inc., Cleveland. For deodorization without appreciable air circulation, doors at the rear of the cabinet may be closed. Six flower perfumes, balsam and an odor called "ozone" are available. "Ozone" is said to be scarcely perceptible but effective in freshening rooms permeated with cooking odors, stale tobacco smoke, etc. Motors are 110 volt, a. c. or d. c. The unit weighs 8½ lb.

●

Tumbler Heater

For use in laboratories, offices, barber shops, beauty parlors, etc., Edwin L. Wiegand Co. has introduced the Chromalox tumbler heater. The unit is rated 115 volts, 350 watts. Its housing is nickel plated copper; it is furnished with 6 ft. of rubber cord, equipped with on-off switch.



Adjustable Window Fans

Two low-priced ventilating fans, with sheet steel frames that can be adjusted to any ordinary window, have been announced by General Electric Co. Both are finished in cream enamel with nickel trim. The 8-in. fan delivers 325 cu. ft. per min., adjusts from 23 to 36 in., and lists at $6.50.

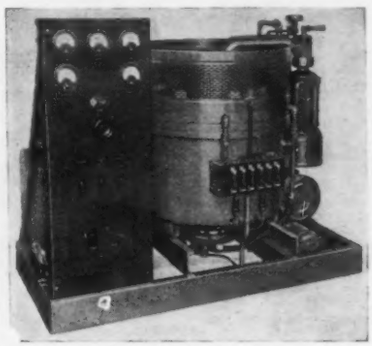
●

Portable Luminaire

Adaptability was the objective in designing the Curtis luminaire, Design No. 41. Designed by Walter Kantack, it incorporates modern lines with standard construction which allows its attachment to existing outlets. The permanent aluminum reflecting surface accommodates a 300- or 500-watt lamp.

Compact Low-Capacity Rectifier

Rectifier tank, auxiliaries and control panel are assembled on a common frame in a simplified, factory-assembled rectifier introduced by Allis-Chalmers Manufacturing Co., Milwaukee. It is rated 150 kw. at 250 volts and 300 kw. at 550 volts, d. c. It occupies a floor space of 3½ x 6 ft., stands 5 ft. high, and weighs about 3,500 lb. It is designed especially for use in unattended substations of buildings, warehouses, etc., and in cities where networks are being changed from d. c. to a. c.



Sealed Flashlight Has Inertia Switch

A flick of the wrist, like "flycasting", motivates an inertia switch to operate a new flashlight, called Megolite, manufactured by Inertia Devices, Inc., 370 Broadway, Albany, N. Y. Absence of external moving parts allows sealed case construction, said to be gas-tight, water-tight, electrically non-conductive and explosion preventing. In the event of bulb breakage, an ejector type socket breaks the circuit and quenches the hot filament against a retaining bail. The light may be dissembled without tools.

●

Electrical Cocktail Shaker

A shaking motion equivalent to that of the most adept bartenders is produced electrically by the new automatic electric drink shaker, called "Shak-Rite," introduced by Walter Welting, Inc., 867 N. Sangamon St., Chicago. The device combines sliding and rocking motions to duplicate the hand process. Ingredients are placed in a graduated glass, a chromium-finished shaker cup is inverted over this and the two are placed on the rocking arm, where they are held together under self-adjusting pressure. A time control can be set between 30 sec. and 3 min., a starting button is pushed and the shaker is in operation. It allows bartenders to serve more customers in a given time.

WHERE TO BUY IT IN THE WEST

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Kelvinator Corp.

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Westinghouse Elec. & Mfg. Co.
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A. B. Chance Co.
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Malleable Iron Range Co.
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Carbon Products
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Roller-Smith Co.
Square D. Co., Inc.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., required by the Acts of Congress of August 24, 1912, and March 3, 1933, of Electrical West, published monthly at San Francisco, Calif., October 1, 1936.

State of California, } ss.
County of San Francisco }

Before me, a notary in and for the state and county aforesaid, personally appeared George C. Tenney, who having been duly sworn according to law, deposes and says that he is the Editor of Electrical West, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

Publisher, McGraw-Hill Company of California.....
.....833 Mission St., San Francisco, Calif.
Editor, George C. Tenney.....883 Mission St., San Francisco, Calif.
Managing Editor .....None
Business Manager .....None
Manager.....Roy N. Phelan, 883 Mission St., San Francisco, Calif.

2. That the owners are: Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amounts of bonds, mortgages, or other securities are: None.

GEORGE C. TENNEY, Editor.

Sworn to and subscribed before me this 17th day of September, 1936.

(SEAL) THEO. LUNSTEDT.

(My commission expires July 30, 1939)

Where to Buy It in the West—*Continued*

Switches, Disconnect
Delta-Star Electric Co.
General Elec. Co.
Kearney Corp., James R.
Pacific Elec. Mfg. Corp.
Schweitzer & Conrad, Inc.
Westinghouse Elec. & Mfg. Co.

Switches, Fuse
General Elec. Co.
Kearney Corp., James R.
Schweitzer & Conrad, Inc.

Switches, Heater
Bryant Elec. Co.
General Elec. Co.
Hart Mfg. Co.

Switches, High Tension
James R. Kearney Corp.

Switches, Meter Test
General Elec. Co.
Meter Devices Co.
Square D Co., Inc.
Superior Switchboard & Devices Co.

Switches—Pressure and Temperature
The Bristol Co.
Hart Mfg. Co.
Square D Co., Inc.

Switches, Safety
Colt's Patent Fire Arms Mfg. Co.
General Elec. Co.
Square D Co., Inc.
Westinghouse Elec. & Mfg. Co.

Switches, Thermostat Controlled
Colt's Patent Fire Arms Mfg. Co.
General Elec. Co.
Hart Mfg. Co.
Thermador Elec'l Mfg. Co.

Switches, Time
General Elec. Co.
Sangamo Elec. Co.

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Delta-Star Electric Co.
General Elec. Co.
I-T-E Circuit Breaker Co.
Westinghouse Elec. & Mfg. Co.

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Western Hardware & Tool Co.
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Jeffries Transformer Co.
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Tubing, Elec'l Metallic
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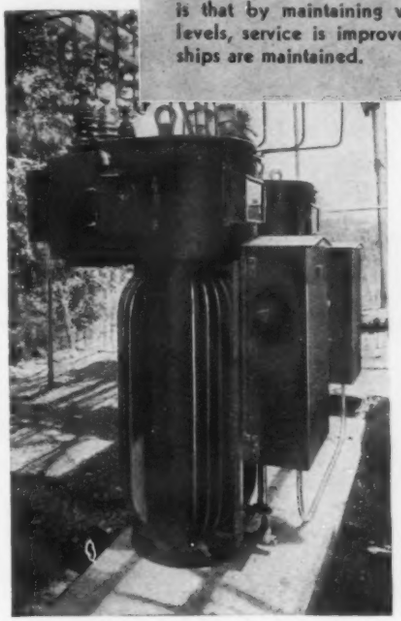

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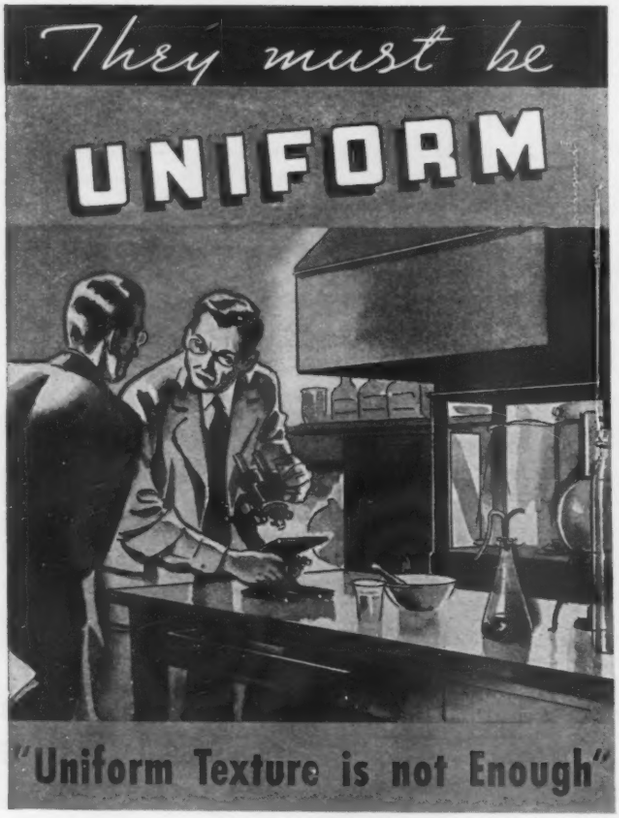

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Columbia Steel Co.
Crescent Ins. Wire & Cable Co.
Crucible Steel Co.
General Cable Corp.
Hazard Ins. Wire Works
Kevstone Steel & Wire Co.
National Elec. Products Corp.
The Okonite Co.
Providence Insulated Wire Co.
Rockbestos Products Corp.
United States Steel Corp.
Westinghouse Elec. Supply Co.

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The regular I. E. S. Certification Tag and inside a special "Birthday" tag, signifying unusual value. These two tags will be used in combination during the month of October.

PARALLEL EACH OTHER THIS MONTH. Number One: A birthday sell-e-bration in honor of the I.E.S. Better-Sight Lamps. In this event, 11 national magazines are being used. Also, to focus attention on the retail store, a variety of "dealer-helps" are being supplied. Campaign number two is a Northern California promotion of 100-watt Mazda bulbs. In this, newspapers are telling the story and the "localizing" is being done with special display cards. Lighting dealers throughout our territory will find these two campaigns dove-tail perfectly.

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But the full benefit will not be reaped by passive waiting for business to "build up." Architects, builders, building supply men, plumbers, are not going to sell OUR product, they are too busy on their own account.

It's up to every man in the electrical industry to sell modern, adequate wiring so that every one of the thousands of new houses will be a prospect for increased use of appliances and service.

If a house has plenty of convenience outlets it's not much of a job to sell the occupants appliances, but if the convenience outlets are already crowded, sales resistance is almost impossible to overcome.

Ask any salesman what he finds the customer's greatest objection is to buying an electric range. He'll tell you it is the wiring cost. If the house is wired for a range, it is a safe bet the choice will be for electric cookery.

RED SEAL specifications include range wiring as well as provision for other major appliances and plenty of convenience outlets.

Help to create this tremendous market for the wares of the electrical industry by urging RED SEAL wiring RIGHT NOW!

CERTIFIED ADEQUATE
RED SEAL
STANDARD
WIRING

Pacific Coast Electrical Bureau

447 Sutter Street, San Francisco
601 West 5th Street, Los Angeles